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31 October 1985

# China Report

ECONOMIC AFFAIRS

ENERGY: STATUS AND DEVELOPMENT--43

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## NATIONAL POLICY

### POWER MINISTER CONFIDENT THAT POWER OUTPUT PLANS WILL BE MET

Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 29 Aug 85 p 3

[Text] The Seventh Five-Year Plan (beginning in 1986) will be a crucial 5 years in the growth of the electric power industry. It is tentatively planned that power output will reach 570 billion kilowatt-hours by 1990 and that the capacity of power-producing facilities will be increased by 35 million kilowatts. This was revealed during an interview granted to this reporter by the Minister of Water Resources and Electric Power Qian Zhengying. She stated that even though this level may be reached, the nation's overall electric power supply situation will continue to be somewhat strained.

Qian Zhengying stated that in 1984 the country had produced 377 billion kilowatt hours of electricity, an 86.7-fold increase over a 35-year period; installed capacity had reached 80 million kilowatts, a 42.3-fold increase [over the same time period]. Today, China has jumped from 25th place and is drawing into 4th place among the world's electric power producers, following the United States, the Soviet Union, and Japan. This rate of growth has been unprecedented among the world's economically developed nations.

This year has been another good one for Chinese power production. Power output for the first half was more than 199 billion kilowatt-hours--more than half of the year's plan and up by 9.1 percent over the same period of 1984 for an increase of 16.54 billion kilowatt-hours.

Minister Qian Zhengying pointed out that although China's electric power industry had grown very rapidly, it still could not meet the requirements of the nation's economic growth. According to preliminary estimates, the total shortfall of electric power for the country in 1984 was between 45 billion and 50 billion kilowatt-hours, or 12 million kilowatts in installed capacity. Today, there are serious power outages in the northeast, east, north, central, south and even the southwest. The electric power industry is the one real weak link throughout the national economy.

She added that to accelerate the growth of the electric power industry, the industry's goals will be to at least "quadruple" both power output and installed capacity by the end of this century, increasing the 1980 output of

300 billion kilowatt-hours to more than 1.2 trillion kilowatt-hours; installed capacity should be increased from 65.9 million kilowatts to something above 240 million kilowatts. After analyzing the development of electric power in the United States and the Soviet Union in the last two decades, she steadfastly maintains that although realizing this goal will be enormously difficult, it will be possible through enough hard work.

In discussing this year's state plan to put generators with a capacity of 5 million kilowatts into operation, Qian Zhengying commented that this was a major step to relieve power shortages and that realizing this objective would lay a solid foundation for installing even greater capacity in the future. She informed this reporter that she had recently visited Shanghai and Xuzhou where she had inspected a number of generating units. The 5-million-kilowatt goal was being firmly implemented and tremendous progress was being made in all the projects. Six thermal generators with a total [capacity] of 550,000 kilowatts were already in operation and another three with a total capacity of 500,000 kilowatts were being operated on a trial basis. One 100,000 kilowatt hydropower unit had been turned over for operation. Additional thermal and hydropower units were being rushed to completion. When this reporter questioned her regarding China's electric power construction policy and strategic plan, she responded by saying that thermal power would be the short-term mainstay to be followed by a shift of emphasis to hydropower; nuclear power would provide an additional source. Concurrently, suiting measures to local conditions, other ways to generate electricity, including oil shale, wind power, geothermal power, solar power, and tidal power, will be developed. Specific plans include:

- 1) A maximum effort to develop hydropower. In the next 20 years, approximately 60 million kilowatts [in installed capacity] should be added. By the end of this century, the nation's total installed capacity should reach 80 million kilowatts. Major stress in the development of hydropower will be on the upper and middle courses of the Chang Jiang, the upper course of the Huang He, and the Hongshui He River Valley. Preparations for the cascade development of the Wu Jiang, Yalong Jiang, Dadu He, Jinsha Jiang, Bailong Jiang, Lancang Jiang, and other river sections are also being made. In mountainous regions with abundant hydropower resources, small-scale hydropower will be actively developed. The Three Gorges key water conservancy construction project is a large-scale hydroelectric project that will provide comprehensive benefits in power generation, flood control, and navigation. This project will play a major role in reversing the situation of power shortages in East China.
- 2) A major effort to develop coal-fired power generation. This will be the power generation mainstay for the next 20 years. Coal-fired facilities will be increased by 110 million to 130 million kilowatts. By the end of the century coal-fired facilities should reach 160 million to 180 million kilowatts. Emphasis will be placed on constructing power bases in mining regions and in ports.
- 3) An appropriate development of nuclear power. Beginning with the Seventh Five-Year Plan, a number of nuclear power plants will be constructed in the next 15 years in the energy deficient coastal areas of Guangdong, eastern China, and the northeast.

## NATIONAL POLICY

### ENERGY STATUS REPORT FOR FIRST HALF OF 1985

Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 12 Jul 85 p 3

[Article by reporter Zhang Heping [1728 0149 1627]: "Sustained Growth in China's Energy Output"]

[Text] Energy output in China reached 766 million tons of standard coal in 1984, an increase of 7.4 percent over 1983, and there has been a rather large increase during the first half of 1985 compared with the same period in 1984.

Coal: The focus for the future is technical transformation, rebuilding and expansion of existing mines.

Electric power: China's seventh large power grid, the South China grid, is being built to link up Guangdong and Guangxi.

Petroleum: The 10 provinces and regions of Jiangsu, Zhejiang, Anhui, Fujian, Hunan, Jiangxi, Yunnan, Guizhou, Guangxi, and Guangdong have been opened to the outside.

This reporter learned from state energy departments that China's current energy production situation is very good. Primary energy output in China reached 766 million tons of standard coal in 1984, a 7.4 percent increase over 1983. This included 789 million tons of raw coal, an 8 percent increase; 114 million tons of crude oil, an 8 percent increase; and more than 270 billion kWh of electricity, an increase of 7 percent. There also has been a rather substantial increase in raw coal, crude oil and electricity output during the first half of this year compared with 1984.

Energy resources are a strategic focus of economic development in China. According to plans, energy resource output in China must reach 1.2 billion tons of standard coal by the end of this century.

According to analysis by experts, the main reasons for the good situation in China's energy resource output are correct policies and a reliance on scientific and technical progress. Related departments told this reporter that the policies and focus for energy resource development in China in the future are:



In the area of the coal industry, besides the need for construction of new mines, the focus should be on technical transformation, rebuilding and expansion of existing producing mines. We must develop mechanization in coal extraction, tunnelling and shipping, reform extraction techniques and develop coal dressing and processing and rational utilization. China now is cooperating with England to manufacture high-efficiency coal extraction machinery, and we have signed contracts for local geological exploration and technical transformation with Thailand and the Philippines. China and the U.S. now are cooperating for development of the Antaibao open-pit coal mine at Pingshuo in Shanxi, and completion is predicted in 1987. In the future, besides active utilization of foreign capital, we also should work to develop domestic capital and collect capital from coal-short provinces and municipalities for use in transformation of old mines and for construction of some new mines. The focus is on continued transformation of rural and small town coal mines so that they gradually achieve standard and safe production.

In construction in the electric power industry, the short-term focus is on thermal power generation, with a gradual shift of focus to hydroelectric power. China will not build any new power plants fueled with petroleum and natural gas in the future. Large-scale backbone thermal power plants matched to development of coal base areas will be built in ports, near railways and other areas of concentrated electric power loads. Related experts feel that China has abundant hydropower resources, and that the amount already developed and used amounts to less than 10 percent of the amount of hydropower resources that can be developed and used, so there is great potential. It has been learned that China now is building and planning to build a group of backbone hydropower stations, including those at Gezhouba and Sanxia on the upper reaches of the Chang Jiang, at Longyangxia on the upper reaches of the Huang He, at Lugube and Tianshengqiao on the Hongshui He, and at other locations. It is predicted that hydropower as a proportion of [total electric power generation] in China will increase from the current figure of 20 percent to around 25 percent by the end of this century. Moreover, a group of nuclear power plants will be constructed as appropriate in coal-short regions along the coast like the northeast, east, Guangdong and other areas.

Related persons told this reporter that there have been very great developments in electric power grid construction in China. The six large inter-provincial northeast, north, east, central, northwest and southwest regional power grids now have taken shape. Four of the grids have an installed generator capacity in excess of 10 million kW.

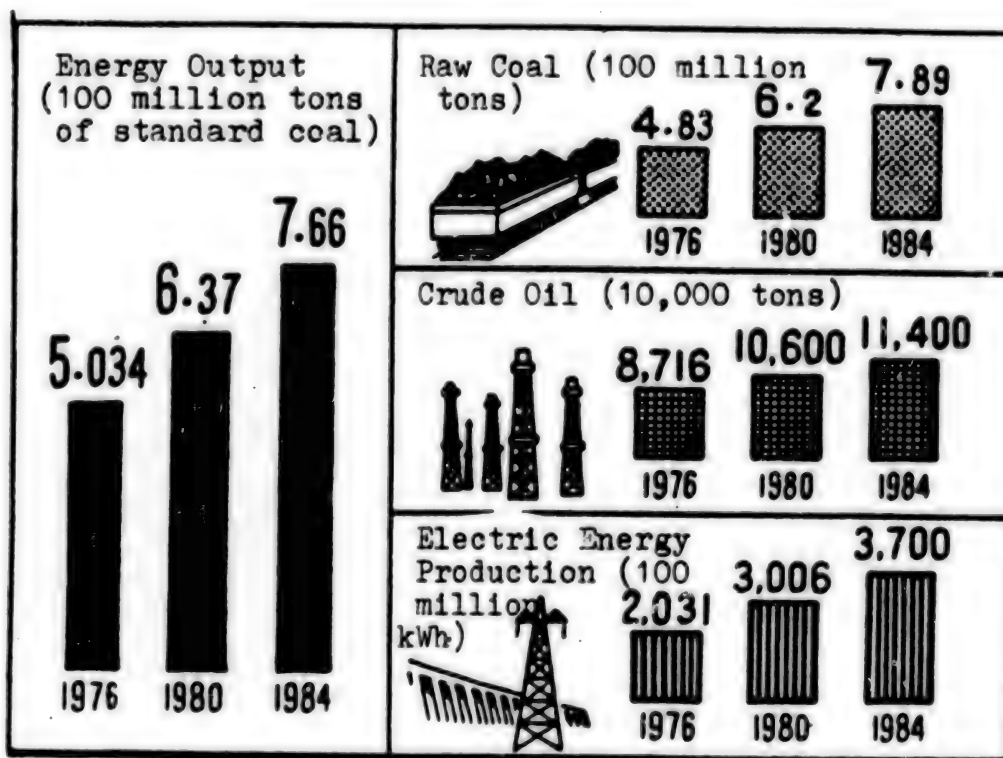
The South China grid linking Guangdong and Guangxi was established recently. Based on local resources, localities, enterprises and the masses in areas outside the large power grids are running small-scale hydropower, thermal power, wind power, geothermal power and other sources to meet the electricity needs of the vast rural areas and small cities and towns.

In the petroleum industry, a responsibility system for crude oil output has been implemented in the past few years and production has increased. Some of the income from surplus crude oil output has been used for exploration and development, and we actively are importing some foreign advanced technology

and equipment. Since the call for bids for cooperative exploration of maritime petroleum with foreign concerns in 1979, crude oil has been found during drilling in the South China Sea [Pearl] River Mouth and Bohai Gulf regions, and considerable progress also has been made in the Yingge Sea and Beibuwan Sea regions. It has been learned that China has opened the 10 provinces and regions of Jiangsu, Zhejiang, Anhui, Fujian, Hunan, Jiangxi, Yunnan, Guizhou, Guangxi, and Guangdong to the outside and that a special China Petroleum Development Company has been set up to take responsibility for cooperation with the outside for development of continental petroleum resources.

The rate and degree of development of coal, petroleum, hydropower and other energy resources is directly related to progress in construction of the four modernizations in China. It is understood that present capital, communications, transportation and other restrictions will affect the rate of energy resource development in China to a certain extent. Related persons have said that we welcome overseas Chinese and foreign businessmen to provide technology, equipment or capital for various forms of cooperation to develop energy resources.

Figure 1. Growth Trends in China's Energy Resource Output



12,539  
CSO: 4013/162



## NATIONAL POLICY

### ENERGY GROWTH IN SIXTH 5-YEAR PLAN RECAPPED

OW161138 Beijing XINHUA in English 1120 GMT 16 Sep 85

[Text] Beijing, 16 September (XINHUA)--China's energy industry recorded major advances during the country's Sixth 5-Year Plan period (1981-1985), according to the State Statistical Bureau.

A total of 70.5 billion yuan was spent in this period on energy projects, 25.6 percent more than during the previous 5 years.

Coal mines have an increased production capacity of 84.6 million tons, beating the target set for the Sixth 5-Year Plan by 4.6 million tons.

Oil wells drilled and put into production in this period have an aggregate capacity of 44.9 million tons, 9.9 million tons over the target, and power stations added have a total generating capacity of 19.6 million kilowatts, 6.7 million kilowatts over the target.

Forty-two big and medium-sized power plants and electric power stations together with 68 big and medium-sized coal mines went into production.

Another 61 energy projects were listed as key projects in 1985, including 15 coal projects, 40 power projects and 6 oil fields.

The bureau noted that China's energy supply, especially electricity, still does not meet the needs of the rapidly developing national economy.

CSO: 4010/171

## NATIONAL POLICY

### KEY ENERGY PROJECTS GET PRIORITY ATTENTION

OW211154 Beijing XINHUA in English 0846 GMT 21 Sep 85

[Text] Beijing, 21 September (XINHUA)--Construction of key energy and transportation projects in China speeded up in the first 8 months of this year, as funds, materials, and equipment were supplied to them on a priority basis, according to today's ECONOMIC DAILY.

The tunneling footage of 14 key coal mines under construction reached 117,000 meters by the end of August. The Linhuan mine in the Huaibei coal field, with a designed annual capacity of 1.8 million tons, is expected to go into production by the end of this year, a year ahead of schedule.

The drilling footage of six key oil fields amounted to 7.44 million meters in the first 8 months, fulfilling 85 percent of this year's plan, which aims at an increased production capacity of crude oil of 7.9 million tons.

Generating units totalling 950,000 kW had gone into production by the end of August, with others on trial operation or being readjusted. Altogether, generating units totalling 5 million kW will go into production by the end of this year, the paper said.

A 310 km railway line between Beijing and Qinhuangdao which will speed the shipment of coal for export from Shanxi Province, China's largest coal producer, has been opened to traffic.

Meanwhile, a 2,700 km medium capacity coaxial cable linking Beijing and Guangzhou went into service earlier this month. The cable, running through 17 cities, was designed to be completed by 1987.

CSO: 4010/171

## NATIONAL POLICY

### HUAI HE RIVER BASIN TO BE BIGGEST ENERGY CENTER IN CENTRAL CHINA

Beijing RENMIN RIBAO in Chinese 12 Sep 85 p 1

[Article: "Huai He River Basin To Become Largest Energy Center in Central China--Large Number of Mines, Pit-mouth Power Plants Now Under Construction"]

[Text] Hefei, 11 Sep--Large and extra-large mines and pit-mouth power plants are being built in the Huai He River Basin. Experts involved in the work say that after these mines and power plants are built, the entire Huai He River Basin will become the largest energy center in central China.

The Pingdingshan, Huainan, Huaibei, Xuzhou, Yanzhou, and Zaozhuang coal bases have been built in this region. Last year, the total coal production in the Huai He River Basin reached 85 million tons and the installed capacity of pit-mouth power plants reached 5 million kilowatts.

The river basin includes the four provinces of Henan, Anhui, Jiangsu, and Shandong with some 182 counties (cities); it covers an area of 270,000 square kilometers. From southwestern Shandong to eastern Henan and Liang Huai, there is a abundant coal everywhere. Coal reserves verified on a preliminary basis exceed 50 billion tons--the largest fields south of the Huang He. The coal here comes in all varieties, the deposits are concentrated, the quality is good and large-scale mining will be convenient.

Today, in addition to the several big coal bases already built, several dozen pairs of jumbo shafts are being constructed with a design annual output of 3 million and 4 million tons of raw coal. New coal bases are now being built in Jining in Shandong, Yudong in Shandong, Huaibei in Anhui, and Feng Xian and Pei Xian in Jiangsu. Concurrently, a batch of pit-mouth power plants is being built in Yanzhou and Jining in Shandong, Huainan and Huaibei in Anhui, Xuzhou in Jiangsu, and Pingdingshan in Henan.

CSO: 4013/7

## NATIONAL POLICY

### GUIZHOU'S COAL, HYDROPOWER RESOURCES ARE DEVELOPMENT TARGETS

Changsha JINGJI DILI [ECONOMIC GEOGRAPHY] in Chinese No 2, May 85 p 97

[Excerpt of article by Li Yongfu [2621 3057 4395]: "Guizhou's Natural Resources and the Way To Use Them Rationally"]

[Summary] Guizhou's principal energy resources include coal, hydropower, methane, firewood, and alcohol, of which coal and hydropower are the most abundant.

Coal reserves are abundant with verified reserves of more than 49 billion tons, putting the province in fourth place behind Shanxi, Inner Mongolia, and Shaanxi. It is, in fact, first among the southern provinces in this respect. The amount of coal being extracted today is somewhat small, some 10 million tons a year, and at this rate coal could be mined for the next 3,000 years.

Guizhou's coal is not only abundant, it comes in many varieties, capable of fueling the metallurgical and chemical industries and providing motive power. The tops and bottoms of some of the coal veins are bordered by deposits of sulphur and iron (the sulphur content is about 15 percent) so that the sulphur could be mined right along with the coal, enhancing the economic return. The coal deposits cover a broad area, encompassing some 70,000 square kilometers or 40 percent of the area of the entire province. Most of it is in the western part of the province, followed by the central portion, with the least amount being found in the eastern portion. One large field is Liupanshui in the west, which also contains high-quality coal. The Zhijin and Nayong fields have large reserves but transportation is poor and they will have to wait for future development.

Guizhou's rivers have large drops and abundant hydropower potential. The province has a theoretical reserve of 18.74 million kilowatts, ranking it sixth in the nation. The square kilometer unit reserve is 106 kilowatts, 1.5 times the average value for the nation as a whole. Some 13.25 million kilowatts of this reserve can be developed, mostly in the form of large and medium hydropower stations. Fifteen large-scale stations with an installed capacity of 250,000 kilowatts and more and 50 medium-scale stations with an installed capacity of from 25,000 to 250,000 kilowatts [could be built]. The mainstream of the Wu Jiang could support a total installed capacity of

5.71 million kilowatts (including the Pengshui hydropower station). Guizhou has excellent conditions for developing its water resources and many river sections have superior sites for building hydropower stations. Major river hydropower sites are close to load centers and, augmented by thermal power, could solve the problem of power shortages during low-water seasons. Only 1.95 million kilowatts have thus far been developed, representing a mere 14.7 percent of exploitable resources.

CSO: 4013/182

## POWER NETWORK

### NINGXIA EXPERIENCES SEVERE POWER SHORTAGE

Yinchuan NINGXIA RIBAO in Chinese 14 May 85 p 1

[Article: "Ningxia's Power Grid Has the Most Severe Electricity Shortage in its History--The Ningxi Autonomous Region's Economic Commission and Electricity Department Are Adopting Urgent and Effective Measures"]

[Text] An increasingly severe electrical shortage appeared in Ningxia's power grid during the last third of April. By 8 May, there was a shortage of 70,000 kW. This was the most severe period of electricity shortage in the grid's history. The Ningxia Autonomous Region Economic Commission and Electricity Department are adopting urgent and effective measures to alleviate this serious electricity shortage, to prevent the collapse of the grid and to guarantee industrial and agricultural production throughout the region and planned, orderly electricity usage for the people's daily lives.

There are two main reasons for this serious electricity shortage. The first is that little water is coming from the Huang He, with output at the Qingtongxia Hydropower Station only 60,000 kW. The second is a dramatic increase in power usage in industrial and agricultural production. The load shot up very quickly and grid supply could not meet demand. The average daily load requirement for the past few days has been 330,000 kW, while actual output in the grid was only 260,000 kW. The Ningxia Autonomous Region Economic Commission and Electricity Department have adopted the following urgent measures to alleviate this situation:

First, every power generating plant under the Electricity Bureau and all electricity supply bureaus must strengthen maintenance of electricity supply equipment, operate carefully, strive for safe operation, and generate and supply more power. Second, the director of the Electricity Bureau has issued a "Bureau Director's Order" calling on all scheduling departments to strengthen scheduling commands and carry out economical and rational scheduling to control the limited amount of electricity within the smallest possible scale. Third, there should be strict planning of electricity use. Chemical fertilizer, calcium carbide, iron alloy and machinery operations should shut down for inspection and repairs, but household electricity usage in these enterprises is guaranteed. Coal mines, aluminum plants and other industrial and mining enterprises must restrict the use of electricity for production.

To implement the above measures, the Ningxia Autonomous Region Economic Commission and Electricity Department have organized two groups to go north and south of Yinchuan and implement them thoroughly in every electricity producing and consuming unit.

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CSO: 4013/163



## POWER NETWORK

### NINGXIA 220 KV POWER LINE TO BE COMPLETED AHEAD OF SCHEDULE

Yinchuan NINGXIA RIBAO in Chinese 14 May 85 p 1

[Article: "The Ningxia Heavy Industry Bureau and Electricity Department Make a Joint Investment To Construct a 220 kV Line In Advance"]

[Text] The Ningxia Heavy Industry Bureau and Electricity Department have agreed to a one-time investment of 3 million yuan to construct a dual-return 220 kV power line from Yinchuan to Dawukou.

After approval by higher authorities, the Ningxia Heavy Industry Bureau decided to collect capital for construction of an aluminum plant at Yinchuan to be completed in 1987. The electricity use load will be 50,000 kW and power will be supplied through a dual-return 220 kV line running from the Dawukou power plant through Yinchuan to Dawukou. Because of insufficient construction capital, however, work cannot begin on this line until 1986. This would make it impossible to guarantee the electricity needed for construction of the aluminum plant. To solve this problem, they requested agreement by the Ningxia Electricity Bureau, with each side adhering to the principle of "whoever makes the investments uses the electricity, and whoever invests more can use more electricity." An agreement was made that there would be a one-time grant of 3 million yuan out of the Yinchuan Aluminum Plant construction fund to move up the construction of the dual-return 220 kV line from Yinchuan to Dawukou to the third quarter of 1985 and to complete it and transmit electricity during the first half of 1986. This line will be 80 kilometers long. Materials departments now are busily preparing the equipment and materials needed for the line and the construction unit will be selected through bidding.

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CSO: 4013/163

## POWER NETWORK

### JILIN TO ACCELERATE POWER CONSTRUCTION

Changchun JILIN RIBAO in Chinese 29 Apr 85 p 2

[Article by Li Wen [2621 2429], Director of the Jilin Provincial Electric Power Bureau: "Accelerating the Pace of Construction in Jilin's Electric Power Industry"]

[Text] Electricity is a primary energy resource in the national economy. Experience at home and abroad has shown that electric power construction should be at the forefront of the national economy, meaning that the growth rate of power output should be higher than the average rate of growth in the total value of industrial and agricultural output. Practice over more than 30 years since the nation was founded also has proven that the national economy can develop quickly only if there is sufficient electricity. A failure of electric power construction to keep pace can influence the rate of development of the entire national economy and affect the people's lives.

Jilin's electric power industry remained in an advanced position for a period of time but now is backward. Jilin's installed generating capacity before 1966 ranked second in China but now has dropped to 14th place. The slow rate of growth in power sources and the substantial growth in electricity usage in industrial and agricultural production and in the people's lives has created a power shortage for a number of years, and the contradiction between electricity supply and demand is becoming increasingly acute. In 1984, the province's electricity shortage averaged 15 percent and there was a 20 percent shortage during the first quarter of 1985. The electricity shortage made it essential to apply the brakes and limit electricity, which directly affected industrial and agricultural production and the people's lives throughout Jilin. According to estimates, the electricity shortage has reduced the value of output in Jilin by 5 billion yuan per year, equal to one-fourth the total value of industrial and agricultural output in Jilin. The electricity shortage has permitted rural areas to be supplied with electricity for only 4 to 6 hours a day. Not even electricity usage for threshing grounds, rice milling and feed processing can be guaranteed. The electricity shortage also has affected the development of rural and small town industries. We can see that accelerating the pace of electric power construction in Jilin to alleviate the contradiction between electricity supply and demand and to solve the electricity shortage is an urgent task of the day.

The basic route for solution of the electricity shortage problem is to increase sources and reduce usage. The focus is on increasing sources and on constructing a group of new electricity sources. Reduced usage, or conservation in electricity usage, also is very important. Jilin conserved 465 million kWh of electricity in 1984, equal to about 3 percent of annual electricity supplies in the province. This played a major role in alleviating the contradiction between electricity supply and demand, and we should continue to focus on electricity conservation. It must be noted, however, that there are limits to reductions in usage and that simple reliance on usage reductions cannot solve the basic problem. Opening up sources mainly involves building new power plants and constructing large generators and large power plants. Simply relying on tapping the potential of existing equipment cannot solve the basic problem.

The principle for development of the electric power industry proposed by the Ministry of Water Resources and Electric Power for the short term is to make the greatest effort to develop hydroelectric power, to work hard to develop thermal power, to develop nuclear power as appropriate, to strive to develop power grids, to utilize other energy resources according to local conditions, to integrate the large, medium and small, and to pay attention both to the short term and the long term. Based on the actual situation in Jilin, we should base our primary attack in the electric power industry on large-scale thermal power construction and we also should focus on the development of hydroelectric power.

We envisage that future electric power construction in Jilin should be "hydro in the east, thermal in the west and integrated production of heat and electricity in the central part." "Hydro in the east" refers to utilization of the hydropower resources of eastern Jilin and construction of a backbone hydropower base area of hydropower stations at Fengman, Baishan, Hongshi, Shuanggou, Xiaoshan and other places with an installed capacity of more than 3 million kW. "Thermal in the west" refers to utilization of coal mines near the Huolin He and the Yimin coal mine in eastern Jilin and taking advantage of being located in a communications junction zone to construct a large-scale thermal power base area with a total installed generator capacity of 5 to 6 million kW centered on Baicheng and Taoan and including the Qian Gorlos Mongol Autonomous County, Da'an and Da'anbei. "Integrated production of heat and electricity in the central part" refers to construction of a heat-electricity co-generation center focused on Changchun, Jilin and other cities. Electricity generation should be combined with centralized heat supplies in large and medium-sized cities.

Based on this idea, apart from focusing on the second period at Baishan and construction of the Hongshi power station, a group of large thermal power stations should be built in the central and western parts of Jilin. They include the sixth period expansion project and installation of two 200,000 kW generators at the Jilin Thermal Power Plant; construction of the Changchun Thermal Power Plant and installation of two 200,000 kW generators; rebuilding of the Changshan Thermal Power Plant and new installation of two 200,000 kW generators; and installation of two 100,000 kW generators at the Hunchun power plant. With hydropower and thermal power growing together, new

generators going into operation in Jilin by 1990 will reach 2.58 million kW, and total installed generator capacity in the province will surpass 5.5 million kW, an achievement of a doubling in installed generator capacity.

This year marks an end to 20 years of stagnation and hesitation in electric power construction in Jilin and a beginning of a take-off. Work at two large power plants, the sixth construction period project at the Jilin thermal power plant and the transformation project at the Changshan thermal power plant is to begin in 1985. The first 200,000 kW generators at these two projects will begin generating electricity in 1987. Preparations for construction of two additional large and medium-scale power plants, the new construction projects at the Changchun thermal power plant and the Hunchun power plant now are underway with urgency and construction will start in 1986. The simultaneous construction of four large and medium-scale power plants (Jilin, Changshan, Baishan and Hongshi) in a single year is unprecedented in the history of electric power construction in Jilin. Moreover, five high-voltage power transmission lines and five primary substations also will be built, so the tasks are extremely arduous. We must concentrate manpower and financial resources to make the first step in the take-off in electric power construction in Jilin.

To accelerate the pace and develop electricity, the Jilin CPC Committee and provincial government have strengthened guidance, and CPC committees and the government in all areas are providing substantial assistance. The Electricity Bureau also has shifted its focus to electric power construction. A great effort has been made at reforms in electric power construction enterprises. An administrative responsibility system and a system of responsible persons for engineering projects has been implemented. Responsibility for investments and wage content per 100 yuan in value of output have been implemented and economic measures are being used to manage electric power construction. Within construction departments, all levels have implemented economic responsibility, and within wage content totals they have implemented piece rate wages, floating wages, over-quota bonuses and other wage incentives. Employee wages now move up and down according to the amount of work completed and more pay for more work truly has been achieved. The initiative of the vast number of electric power construction employees has been motivated fully to shorten construction times, lower construction costs and improve results.

To speed up electric power construction in Jilin, we must eliminate the old restrictions of independent power plant management, integrate the state, collectives and individuals and have the large, medium and small move forward together, and expand channels and collect even more investments for electric power construction. The government of Jilin has decided to collect 100 million yuan in capital for a joint investment with the Ministry of Water Resources and Electric Power to construct the Changchun thermal power plant. They also will collect capital to build the Hunchun power plant.

Hunjiang also is actively collecting capital for construction of the Hunjiang power plant. Local coal will be used to generate electricity, with self-generation and self-usage. A small power plant run by the Changchun Bus

Plant itself now has begun generating. Small-scale hydropower also is growing, with the state, localities, enterprises and the masses running power plants. This is an important measure for accelerating construction.

Construction of large power plants means that there are many large extra high-voltage power transmission lines that affect large areas. We should speed up the pace of construction and shorten construction time. This is impossible without substantial support from local governments, the masses of the local area and all industries and sectors. All project headquarters and all electric power construction departments should rely on local CPC committees and governments for leadership to spread the word about the significance of electric power construction to the masses and all industries and sectors in the local areas and to obtain their support, assistance and cooperation to work as quickly as possible in the areas of requisitioning land, relocation, transportation, supply and other areas. This will facilitate the signing of various types of agreements and cast off any factors that affect the progress so that electric power construction in Jilin achieves a rapid take-off.

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CSO: 4013/163



## POWER NETWORK

### NEW JILIN POWER PLANT TO RELIEVE ENERGY SHORTAGE

Changchun JILIN RIBAO in Chinese 19 Jul 85 p 1

[Article: "Government of Jilin Decides To Collect Capital for Participation in Construction of Tongliao Power Plant--Purpose Is To Alleviate Contradiction Between Electricity Supply and Demand and To Promote Industrial and Agricultural Production"]

[Text] Editor's Note: There is a sharp contradiction between supply and demand for electric power in Jilin. The inadequate supply of electricity has greatly affected industrial and agricultural production and the people's lives. It is urgent that electric power construction be speeded up. This is strongly related to invigorating Jilin's economy and to guaranteeing achievement of the magnificent goal of quadrupling the total value of industrial and agricultural output by the end of this century.

To accelerate electric construction, the state has formulated policies to encourage localities to collect capital for power management. Much practice in capital accumulation of electric power construction by the province and cities has proven that this route provides quick and substantial results. The government of Jilin has decided to use capital collection shares for joint investment in management of the Tongliao power plant. This matter concerns the overall situation. It should be implemented quickly and handled well.

At present, preparations for various types of capital collection are feasible and they have benefits for the state, localities, units and individuals. Key regions and enterprises that use electricity must stand a bit taller and take a longer-term look to actively accumulate capital and strive to have larger power users provide more capital. The issuance of bonds concerns everyone. Propaganda and mobilization work must stand at the front so that everyone can understand their significance. During the issuing process, we certainly must adhere to the principle of voluntary purchase. There absolutely can be no rigid allocations.

\* \* \*

The Jilin provincial government has decided to collect capital for participation in construction of the Tongliao power plant. This decision was announced

today at a conference on capital collection for electric power construction convened by the government of Jilin.

Jilin now has an annual electricity shortfall of more than 2 billion kWh. To alleviate the contradiction between electric power supply and demand, the provincial government has decided to participate in joint investments with the Ministry of Water Resources and Electric Power for operation of the Tongliao power plant. The investment will be 65 million yuan. After the investment, Jilin will be able to obtain more than 250 million kWh annually beginning this year.

To collect the 85 million yuan investment, the government of Jilin decided to collect capital from prefectures, cities, autonomous counties, large enterprises and residents and gave responsibility to the Jilin Economic Development Company. The actual method was:

1. Those who invest can use the electricity. This has linked electricity usage with investment contributions. More specifically, any region or unit that invests 10,000 yuan can obtain electricity indexed at 25,000 kWh. The capital is an interest-free loan and the electricity is supplied at equal cost. The time period is set at 5 years. If the capital has been fully recovered at the end of this period and the electricity usage index has been recovered, electricity usage contracts can be continued or renewed. A policy of "three guarantees and one preference" is implemented for investing units. It guarantees that the original electricity supply base number will not change, that electricity will be supplied according to the amount invested and that the capital will be recovered as scheduled, and it gives preference for signing an electricity supply contract for 5 more years.
2. Loans are made by large enterprises. The loans have a term of 1 to 3 years and the annual interest rate on the loans is 8 percent for a 1-year loan, 10 percent for a 2-year loan and 13 percent for a 3-year loan.
3. Energy resource development bonds have been issued widely to urban residents. The plan is to issue 50 million yuan in bonds starting in August. There will be four types of bonds with face values of 100, 500, 1,000 and 5,000 yuan. The bonds are to be repaid over 3 years. Interest will be paid once 3 years from the date of purchase. The interest rate on the bonds is 13 percent and is not compounded. Issuance of the bonds will begin on 10 August 1985 and end when they are sold out. The Jilin Industrial and Commercial Bank will act as agent for the bond issuing work.

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## POWER NETWORK

### BEIJING, TIANJIN, TANGSHAN GET MORE ELECTRICITY

OW171922 Beijing XINHUA in English 1907 GMT 17 Sep 85

[Text] Taiyuan, 17 September (XINHUA)--A new power transmission line linking Beijing, Tianjin, and Tangshan with the coal fields of Shanxi Province was completed on Sunday.

The 500 KV line will help supply 5 billion kilowatt-hours of electricity a year to the huge industrial area around the capital, which is short of power.

The new 115-kilometer transmission line between Shentou and Datong is connected with a section from Datong to Fangshan on the outskirts of Beijing.

At present, power-generating units with a capacity of 550,000 kilowatts have gone into operation at the Shentou thermopower plant. The plant will eventually have a capacity of 1.35 million kilowatts.

The line was completed a fortnight ahead of schedule.

CSO: 4010/171

## POWER NETWORK

### FUJIAN POWER OUTPUT INCREASES 50 PERCENT IN 5 YEARS

HK290141 Beijing ZHONGGUO XINWEN SHE in Chinese 0302 GMT 27 Sep 85

[Text] Fuzhou, 27 Sep (ZHONGGUO XINWEN SHE)--This reporter has learned from the Fujian Provincial Power Industry Bureau that the total installed capacity of the province's power industry has reached 2.1 million kilowatts and that generated energy will reach 7 billion kilowatt-hours this year, an increase of more than 50 percent over 1979.

With its many rolling hills and crisscrossing rivers, Fujian has rich hydroelectric resources. Survey results show that in this province it is possible to build about 1,000 hydropower stations, each capable of producing more than 500 kw of electricity. They can provide a total of 32 billion kWh of cheap electricity per year. Since the 1950's when the grade-four hydropower station with an installed capacity of 250,000 kW was built on the Gutian River, Fujian has built five medium-sized hydropower stations in Ansha, Chitan in Taining County, Shanmei in Nanan County, Hangchangxi in Nanjing County, and Huaan County on the Jiulong River, as well as hundreds of small power stations in mountain villages. At present, the total installed capacity of these small power stations is 900,000 kW. Last year they produced 2.2 billion kWh of electricity. They are also useful for navigation, irrigation, and flood prevention.

Since the 1960's, the state has also invested in Fuzhou, Xiamen, Yong'an, Zhangping, Shaowu, Longyan, and other areas on the building of 10 thermal power plants, the total installed capacity of which is 620,000 kW. Most of them have been built in industrial areas, and districts along railways. They all use coal produced in this province as fuel.

The projects now under construction include two 100,000-kW generating sets for the Zhangping Thermal Power Plant, four 75,000-kW generating units for the Shaxikou Hydropower Station, and two 350,000-kW generating sets for the Fuzhou Thermal Power Plant. When these projects are completed and put into production in 1989, the total energy generated by this province will reach 10 billion kWh a year. Thus, there will be sufficient electrical energy to satisfy the needs of industrial and agricultural production and the people's daily life.

CSO: 4013/8

## POWER NETWORK

### BEIJING, TIANJIN, TANGSHAN USE MUCH OF SHANXI'S ELECTRICITY

Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 28 Sep 85 p 1

[Article by reporter Wang Aisheng: "Shanxi Transmits More Than 5 Million Kilowatt-hours a Day to Beijing, Tianjin, and Tangshan; More Than 70 Large, Medium, and Small Thermal Power Plants Built"]

[Excerpt] Making full use of its superior power-generating coal resources, Shanxi Province has already constructed more than 70 large, medium, and small power plants. As of August 1985, the province had generated a total of 1.97 billion kilowatt-hours of electricity, an increase of 10.7 percent over the same period of 1984. On average, more than 5 million kilowatt-hours are transmitted to Beijing, Tianjin, and Tangshan every day.

Shanxi Province is a heavy and chemical industry base whose state-operated, local, and village-run coal mines produced a total of 186 million tons of coal in 1984.

Building pit-mouth thermal power plants to make use of Shanxi's coal converts the coal to electricity, reducing the coal stockpiles and eliminating transportation bottlenecks, and constitutes a strategic measure to develop the province's energy resources. Coordinating with concerned state organs, the Shanxi Provincial Party Committee and Government has now completed 14 large and medium power generating facilities including Shentou, Datong, Huo Xian, Niangzi Guan, Taiyuan, Yongji, Houma, and Yangquan with a total installed capacity of 3.07 million kilowatts. Of these, 93.5 percent are thermal power plants. Also, 58 small thermal power plants and hydroelectric power stations have been built. An average of 8 million tons of coal a year are used to generate electricity. The Datong No 1 and No 2 plants and the Shentou plant, along with others, are built at or near the mouths of mines.

Shanxi Province has erected a 220kV power network that extends from east to west (Niangzi Guan to Baode Xian) and from north to south (Tianzhen Xian to Yuncheng), forming a power generating, supply, and regulatory system that covers the entire province. Advanced facilities such as computers and microwave and carrier wave equipment are being employed. Electricity reaches all parts of the countryside and some 32,000 villages, or nearly 80 percent of the total number of villages. have electricity.

In additon to the power it consumes itself, Shanxi transmits power outside the province in a steady stream. The three high-tension power lines erected from Niangzi Guan to Shijiazhuang, from Datong to Beijing (Fangshan), and from Shentou to Datong are referred to as "aerial corridors," As of August of this year, 1.322 billion kilowatt-hours of electricity had been transmitted to Beijing, Tianjin, and Tangshan, an increase of 25 percent over the same period of 1984.

CSO: 4013/11

## POWER NETWORK

### BRIEFS

**NINGXIA'S FIRST 220KV SUBSTATION**--Construction of Ningxia's first 220,000-volt substation, a key transformer project, officially commenced on 1 June in Yinchuan's Xincheng district. This project is the first phase of operation of the Dawukou Power Plant and is an important project for linking Ningxia's power grid with Gansu's power grid. After entering into operation, it will play a major role in relieving the severe shortage of energy needed for Ningxia's industrial and agricultural production and for improving Ningxia's energy supply system, stability and reliability. The workers from the Xibei Power Construction Bureau of the Ningxia Transformer Engineering Company who have undertaken the construction tasks have already started construction and aim to complete their work by the end of August. [Text] [Yinchuan NINGXIA RIBAO in Chinese 15 Jun 85 p 1]

**NINGXIA 330KV PROJECT**--The project to link Ningxia to the Shaanxi-Gansu-Qinghai power grid by means of a 330KV high-tension power transmission line is a major undertaking for the northwest power system for 1985. The line, 134.6 kilometers long, will cross the two provinces (regions) of Gansu and Ningxia and the four counties of Jingyuan, Haiyuan, Tongxin, and Zhongning. When completed, the line will not only improve the stability of the Ningxia power grid, it will also enhance the operations within the entire northwest grid. This marks the first time that either of the two units undertaking this task has tackled a 330KV transmission project. [Summary] [Yinchuan NINGXIA RIBAO in Chinese 19 Jun 85 p 1]

**BEIJING 500 KV LINE**--The Beijing section of the Datong-Fangshan 500 KV extra high-tension power transmission line was completed on 26 August. Starting from the Datong No 2 Power Plant in Shanxi Province in the west and ending at the Fangshan 500 KV transformer substation in Beijing in the east, this power transmission line covers a total length of 285 km, and will be totally completed and put into operation this year. Upon completion, this line will play an important role in relieving the power shortage in Beijing, Tianjin, Tangshan, and the southern part of north China. [Summary] [Beijing City Service in Mandarin 1000 GMT 27 Aug 85 SK]

BEIJING 220KV LINES--Two 38.74-km-long 220,000-volt high tension power transmission lines between the western suburbs and the northwestern suburbs in Beijing Municipality have been constructed. The Beijing Electricity Supply Bureau is examining the construction of these two power transmission lines before accepting them. [Summary] [Beijing City Service in Mandarin 1000 GMT 1 Sep 85 SK]

NEI MONGGOL POWER INDUSTRY--During the Sixth Five-Year Plan, our region has achieved rapid development of the power industry and has increased the installed capacity of thermal plants from 1.14 million kW in 1980 to 2.17 million kW at present. The region's total power output has reached more than 2.6 million kWh each quarter, greatly surpassing the target set forth by the Sixth Five-Year Plan. In the period, in order to make use of the region's abundant coal resources, the State Council has invested in the building of a large number of large-sized thermal power plants, including the Tongliao and Yuanbaoshan plants. Our region has also raised funds to expand old plants and to help them conduct technical renovations, resulting in a large increase in installed capacity. Meanwhile, localities concerned have erected power transmission lines. According to statistics, in 1980, the region only had 9,087 km of power transmission lines of or under 35 kilovolts. Today it has had more than 17,000 km that have formed a western network with Baotou and Hohhot cities as centers and the independent network of a number of areas in Wuhai City and Hulun Buir League. These networks have basically relieved the strained situation in power supply of some key localities. [Text] [Hohhot Nei Monggol Regional Service in Mandarin 1100 GMT 3 Oct 85 SK]

HEBEI INCREASES OUTPUT, CONSUMPTION--During the period of the Sixth Five-Year Plan, our province has achieved a great development in the power industry and fulfilled or overfulfilled the targets set forth by the plan in electrical installed capacity and power supply. In the first 4 years of the period, the province's newly installed capacity reached 978,900 kilowatts, newly built transmission lines reached 3,476 km, and newly-built transformer capacity reached 1.65 million kva. Average hours of utilizing generating equipment reached 6,176 hours, topping the previous peak of the country. During the Sixth Five-Year Plan period, the province's power consumption in agriculture and industry has continuously shown a yearly average increase of 7.6 percent. As of the end of 1984, the province's consumption reached 19.96 billion kWh, ranking fourth in the country. As compared with 1980 figures, industrial power consumption showed a 15.8 percent increase agricultural consumption, a 38 percent increase and the urban office and residential consumption, a 52.3 percent increase. At present, all counties throughout the province are connected with power supply lines. Townships and villages that have power have respectively reached 97 percent and 93.8 percent. Annual per capita power consumption in the province, basically satisfied the power consumption standard set for rural areas by the State Council. [Excerpts] [Shijiazhuang Hebei Provincial Service in Mandarin 2300 GMT 17 Sep 85 SK]



SICHUAN 220KV LINE FINISHED--Sichuan Province's power grid has another new line. A 220KV high tension power line running from Ziyang through Baishan to Ziyang became operational on 3 July. With a total length of 123 kilometers, this line will guarantee a reliable source of power for this section of the Chengdu-Chongqing railroad and the area around it. [Excerpt] [Chengdu SICHUAN RIBAO in Chinese 27 Aug 85 p 2]

NORTHEAST GRID EXPANSION--Four large power generating sets have been installed in the northeast power grid and the increased rate in installed capacity has topped the previous peak. As of now, the two generating sets have been put into production while the other two have been put into trial operation. They will be put into production at the end of 1985. The total installed capacity of the four generating sets is 1.1 million kilowatts, accounting for 22 percent of the total newly increased power capacity of the country. When all of them are put into production, their annual power output will be nearly 4 billion kWh and they will relieve to a considerable extent the strained power supply in the northeast provinces. [Text] [Shenayng Liaoning Provincial Service in Mandarin 1030 GMT 26 Sep 85 SK]

XINJIANG POWER INDUSTRY--The region's power industry has been developing rapidly with each passing day--its installed capacity and generated power for 1984 increased by 4300 percent and 6100 percent respectively compared with 1955. Before liberation there was no modern power plant in Xinjiang. The region's first thermopower plant, the (Weilianghu) Power Plant, was built in 1953. There are now 549 thermopower plants and hydropower stations in the region, with a total installed capacity of 1,062,500 kilowatts. The region has built five grids, each of 110 KV or higher. Power is now supplied to the region's 12 prefectures and autonomous prefectures, 9 cities, and 80 countries. In recent years, power industry staff members and workers have been carrying out reform by practicing various economic contract systems. In 1984, the region fulfilled a year ahead of schedule the target of the Sixth 5-year Plan for power generation. [Text] [Urumqi Xinjiang Regional Service in Mandarin 1300 GMT 25 Sep 85 HK]

RECORD OUTPUT FOR EAST CHINA GRID--The East China power grid, which supplies electricity to Jiangsu, Zhejiang, Anhui, and Shanghai, generated 32.3 billion kWh in the first half of the year, a 9.6 percent increase compared to the same period last year and the highest level ever. [Excerpts] [Yinchuan NINGXIA RIBAO in Chinese 26 Jul 85 p 1]

CSO: 4013/2



## HYDROPOWER

### SUGGESTED DEVELOPMENT SCHEME FOR MIDDLE COURSE OF THE HUANG HE

Beijing SHUILI SHUIDIAN JISHU [WATER RESOURCES AND HYDROPOWER ENGINEERING] in Chinese No 6, 20 Jun 85 pp 59-62

[Article by Wei Yonghui [7614 3057 2547] of the Ministry of Water Resources and Electric Power, Tianjin Survey and Design Academy: "A Proposal for Establishment of a North Trunk Hydropower Base Area in the Togtoh-Longmen Section of the Huang He"]

[Text] Four hydropower stations now have been constructed in succession in the upper reaches of the Huang He at Liji Xia, Yanguoxia, Bapanxia and Qingtongxia and the Longyangxia hydropower station is now under construction. Total installed generating capacity in power stations already constructed or under construction is 3.244 million kW. Survey and design work also is proceeding urgently on the Liji Xia, Heishanxia (Dalingshu), Daxia, and Laxiwa hydropower stations. In the middle reaches of the Huang He, however, only the Sanmenxia and Tianqiao hydropower stations have been constructed since liberation and the total installed generating capacity is only 378,000 kW. Moreover, not many projects now are in the survey and design stage and there is a great disparity in comparison with the upper reaches of the Huang He. The middle reaches of the Huang He and especially the northern trunk have rich hydropower resources and fairly good development conditions. I suggest that a hydropower base area for the North China grid be constructed on the northern trunk. This is a strategic measure for accelerating hydropower construction. This article will provide a brief description of the proposal.

#### I. Hydropower Resources in the Northern Trunk

The middle reaches of the Huang He contain rich hydropower resources. The river channel in the northern trunk (from Togtoh to Longmen) lies in a gorge and has a concentrated head. This section of the river extends for a total of about 725 kilometers, has a head of 607 meters and an average gradient of 0.084 percent. The measured long-term average annual runoff is 31.95 billion cubic meters. Both banks of this section of the river have steep walls that are several tens to 100 or 200 meters above the water surface, and the river is 300 to 600 meters wide. The rock strata outcrops are Cambrian and Ordovician era limestone and Permian and Triassic era shale. The lithology is rather singular and the strength generally is high. The strength of some marl and shale is rather low. The land mass is stable and structures are simple. Earthquake intensity generally ranges from grade 6 to 7. Based on the characteris-

tics of this river section and the effects on completed projects, the cascades in the northern trunk can be divided into three sections running from: 1) Togtoh to Longkou, 2) Tianqiao to Jundu, and 3) Jundu to Longmen. Related units have made many plans for the northern trunk from the 1950's to the 1970's. According to a 1978 plan by related units, a cascade of eight steps could be constructed at Wanjiazhai, Longkou, Tianqiao, Qianbeihui, Qikou, Jundu, Sanjiao, and Longmen (a high dam). The total installed capacity would be 4.528 million kW and annual power output would be 16.75 billion kWh. Of this amount, 128,000 kW in installed generating capacity has been completed at the Tianqiao hydropower station and annual power output is 610 million kWh, only 3 percent of developable capacity. Development of this river section basically is a blank. The location of each of the cascades is shown in Figure 1 and the primary indices are shown in Table 1. It can be seen in Table 1 that the three cascades out of the total of eight at Wanjiazhai, Qikou, and Longmen have rather large reservoir capacities. This allows a seasonal regulation capability as control projects. The other steps would be runoff power stations.

## II. The Necessity of Developing the Northern Trunk and the Tasks Involved

There are rich mineral resources along both banks of this river section, the most prominent being coal resources. Shanxi's Datong, Pingshuo, Hepianbao, Taiyuan and other coal base areas lie on the left bank, while such coal base areas as Jungar in Nei Monggol and Shaanbei and Guanzhong in Shaanxi lie on the right bank. There are rich reserves. Of this group, Shanxi and Nei Monggol have become the focus for state construction of energy resource and heavy and chemical industry base areas in the near future. Part of the extracted coal will be sold abroad, while most of it will be converted locally into thermal power for transmission to the Beijing-Tianjin-Tangshan area. Construction of the base areas urgently requires large supplies of water for industrial and urban use.

Both banks of the river section, however, are semi-arid regions with only 400 to 500 mm of annual precipitation and little surface runoff. Agricultural production frequently is endangered by disastrous drought. Yields are low and only 11 percent of all cultivated land is irrigated. If we wish to make a fundamental change in the situation of drought and water shortages, we must adopt engineering measures and divert the Huang He to Shanxi. The northern Shaanxi, northern Wei He and southern Shanxi regions are Shanxi and Shaanxi provinces' primary grain-producing regions and they are in urgent need of water diversion for irrigation.

The electric power load in the North China region has grown dramatically as the national economy has developed. The North China grid currently is composed of the Beijing-Tianjin-Tangshan, Nei Monggol, Shaanxi, and Southern Hebei grids. Total installed generating capacity in 1982 was 10.08 million kW. Hydropower accounts for just 577,000 kW of this amount, only 5.72 percent of total installed generating capacity. There was a 2.40 million kW peak-to-valley grid load differential in 1982. Peak regulation is accomplished mainly through restrictions and braking. Some regulation depends on fuel-oil generators. Peak-to-valley load differentials are expected to reach 5 million kW in 1990 and 12 million kW in 2000. Arrangements for peak regulation electricity sources

have become an urgent need in the North China grid. Three main ways to solve the problem can be suggested: 1) Send power from west to east; 2) Build pumped-storage hydropower stations with reservoir capacity; and 3) Build conventional hydropower stations. The three routes can be complementary and are not mutually exclusive. Sending electricity from west to east would involve long lines. The terrain and geological conditions of the water-lifting power stations with storage capabilities also are not ideal. It is apparent, then, that the only reliable and economical peak regulation power source is to construct conventional hydropower stations. Hydropower resources are limited in the Hai He and Luan He river basins, however. Design capacity in all of the hydropower stations that have been planned is low, generally less than several 10,000 kW and investments per kW are rather high, around 2,000 yuan in all cases. The developable hydropower resources in North China are concentrated mainly in the northern trunk of the Huang He. This makes development of hydropower on the northern trunk an inevitable trend in developmental patterns for bearing peak loads in the North China grid.

In summary, the development tasks for this river section are:

1. Establish peak regulation power stations to take on peak loads in the North China grid; 2) Supply water for industrial and urban use in energy resource and heavy and chemical industry base areas; 3) Integrate cascaded development, establish key water diversion projects and develop agricultural irrigation; 4) A few key projects such as Longmen can be matched up with the Sanmenxia key project for flood prevention and for silt regulation.

### III. Favorable Conditions for Development of the Northern Trunk

Preparation work for construction of the Wanjiashai power station began in the 1950's but construction never started because of unforeseen events. The opportunity to develop the northern trunk is even riper now than in the 1950's. There are several favorable conditions:

1. Upstream reservoir regulation has improved the distribution of runoff during the year, which is advantageous for power generation and irrigation. An examination of data on runoff regulation at Longyangxia and Liujiaxia shows that they have increased runoff during the dry season and reduced runoff during the rainy season. In Hekouzhen, for example, runoff during the 4 dry months would increase from 39.4 percent of annual runoff (a long-term measured average) to 56.2 percent (design value for the year 2000). If regulation from the Heishanxia reservoir were available in the long run, the value could rise to 62.9 percent.

2. The geographical position is in the center of the key development regions and the economic benefits from development would be substantial. The Wanjiashai hydropower station is located in the river section connecting the upper and lower reaches of the trunk of the Huang He. Establishment of reservoir regulation capacity could serve to receive water from upstream and send it on downstream. Moreover, it is located in the center of the Nei Monggol and Shanxi power load. It is 150 km from Hohhot, 170 km from Datong and 450 km from Beijing. The Qikou hydropower station is 150 km from Taiyuan. The Longmen

hydropower station is 230 km from Xi'an and 300 km from Zhengzhou. Establishment of all the cascades on the northern trunk could link up the Northwest, North China and Central China grids for joint operation of hydropower and thermal power stations, which would make full use of each of the power stations. Utilization of hydropower to develop irrigation would play a substantial role in agricultural development in the region (an old revolutionary base area).

3. Communications conditions are convenient and the Datong-Puxian railway runs roughly parallel with the northern trunk. The Wanjiashai dam site is only 79 km from the railway and the Longmen dam site is only 25 km from the railway. Highways extending to all of the dam sites run along both sides of the river.

4. Losses due to inundation would be slightly larger at Qikou and Longmen, but would be very small in all the other cascades in the system.

5. The conditions exist for continuous development, which can aid in lowering the cost of construction. The Wanjiashai hydropower station has become a key project for preparatory work during China's Sixth Five-Year Plan. Feasibility studies on this hydropower station indicate that total installed generating capacity could reach 1 million kW and the investment per kW would be about 1,100 yuan. The conditions for development are most mature. Total installed capacity in the downstream Longkou, Qianbeihui, Jundu, and Sanjiao power stations could exceed 1 million kW and the estimated investment per kW could be less than 1,500 yuan. It can be developed in succession after Wanjiashai. This would require only a single construction staff and facilitate orderly activities. It also can shorten construction time and lower cost. Development of the Qikou and Longmen cascades can be postponed because of the greater amount of work and investment required.

#### IV. Silt Problems

The river basin in the Togtoh section of the Huang He covers an area of about 110,000 square kilometers and is mainly loess with hills and gullies. Soil erosion is serious, with a large amount of silt entering the Huang He during the rainy season each year. It is the primary source of silt in the Huang He. The long-term measured yearly average amount of silt is 150 million tons at Hekouzhen and 1.1 billion tons at Longmen, so the amount of silt arriving between Hekouzhen and Longmen is 950 million tons.

Silt is a primary negative factor in development of the northern trunk. This is especially true of the silt problems at the key Sanmenxia project, which have caused some policymakers to remain hesitant to develop this river section. It should be noted, however, that rich experience for development of hydropower in the middle reaches of the Huang He has been accumulated through the obvious results seen after successful reconstruction of the Sanmenxia key project (with annual silt transport of 1.6 billion tons) and operation of the Tianqiao hydropower station (with annual silt transport of 350 million tons).

Summarizing the experience at Sanmenxia, Tianqiao, and other hydropower stations built on the Huang He, the following measures can be adopted to deal with the negative effects of silt on reservoirs, power stations and flood discharge facilities:



1. Adopt the operational pattern of "storing the clean and draining the muddy" and sluice flow at a sufficient scale to guarantee effective reservoir capacity.
2. Select rational key project arrangements, including installation of low holes, and place generator water intakes above the low holes. In addition, the installation of silt drainage holes below them is advantageous for silt drainage from key projects and reducing the silt content passing through the generators.
3. Select rational shapes for sluice facilities and lock channels and adopt anti-wear measures, and leave some room for inspection.
4. Adopt measures to reduce abrasion from silt in the design, manufacture and operation of parts for the flow passing through the turbines: 1) Select low-parameter designs; 2) Increase the latitude in equipment erosion coefficients; 3) Adopt anti-corrosive stainless steel materials and improve manufacturing techniques; 4) Adopt anti-corrosion coatings and make it easy to replace worn parts or prepare for equipment rotation; 5) Prevent unfavorable operating conditions and restrict the scale of operations as appropriate, including shutdowns during high silt periods.

Of course, the operational pattern of "storing the clean and draining the muddy" will reduce output during the rainy season, which is a shortcoming of the cascaded power stations on the northern trunk. This is, however, precisely a period of declining load in the North China grid and is permitted by the system. During joint operation of hydropower and thermal power, rational arrangements of inspection and repair schedules for hydro and thermal power generators can supplement and compensate for this shortcoming. The things described above have been confirmed through practice in operation of the Sanmenxia power station and through calculation of the benefits of the kinetic energy of the Wanjiashai power station.

Figure 1. Cascaded Development Layout of the Togtoh-Longmen Section of the Northern Trunk in the Middle Reaches of the Huang He

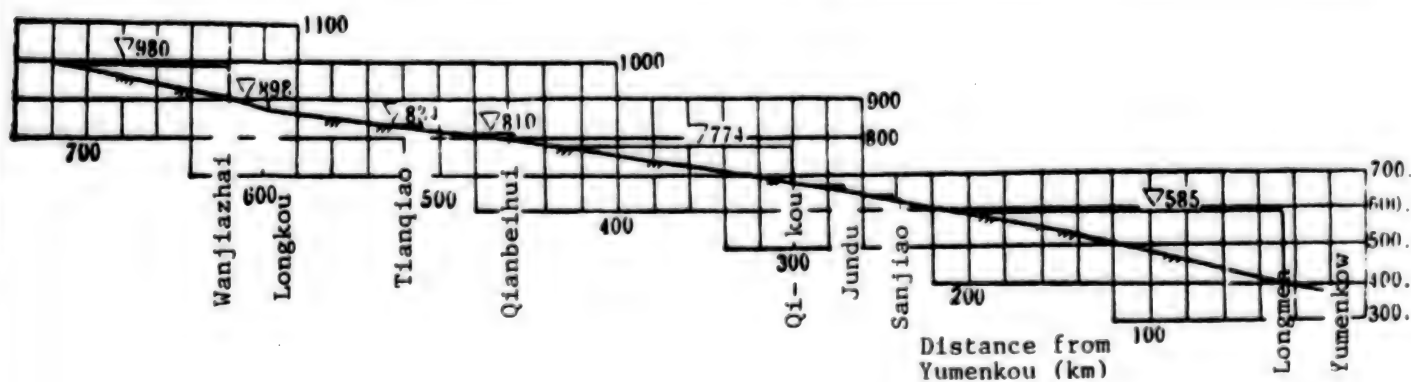
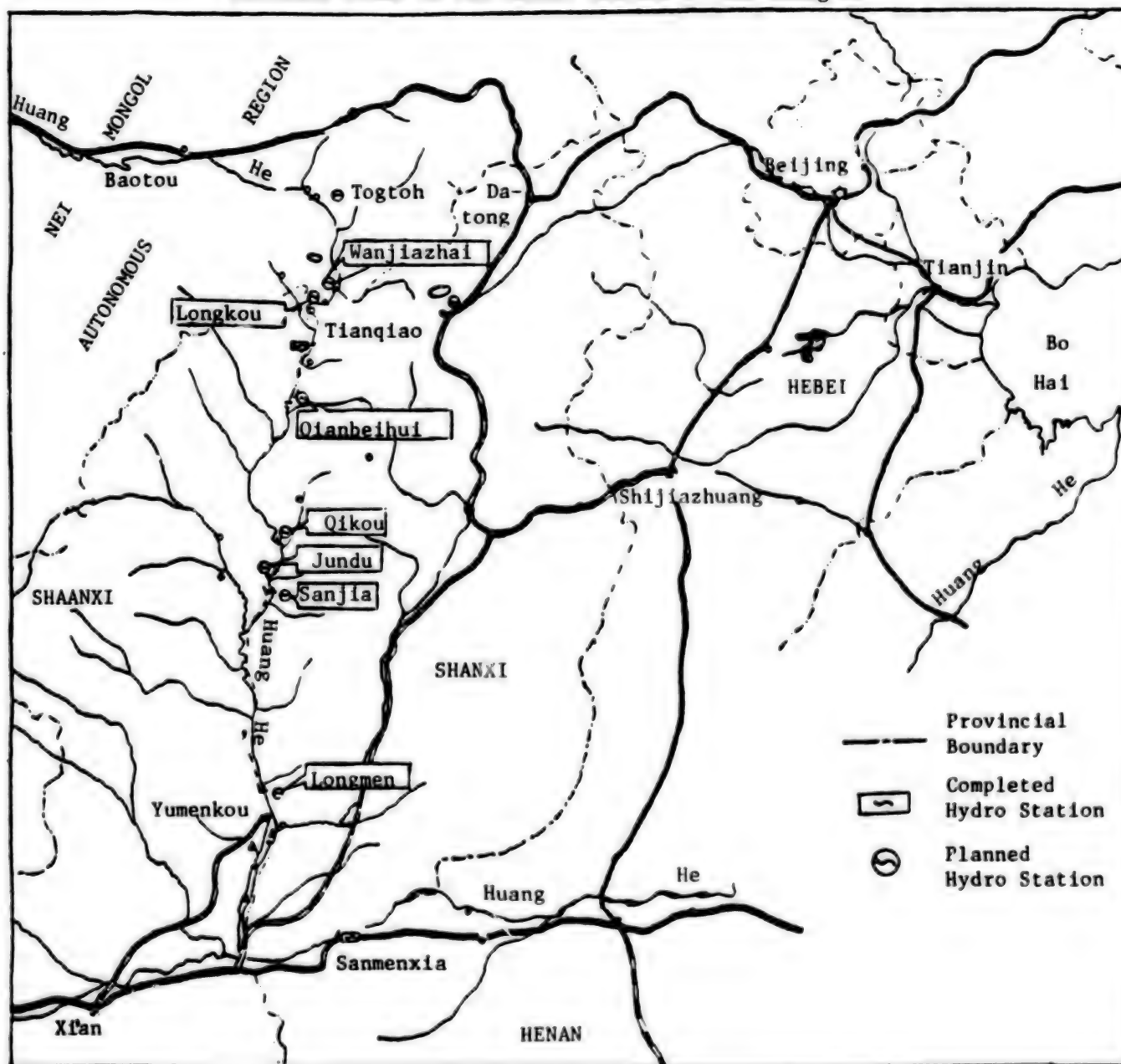




Table 1. Primary Indices of Each Cascade on the Northern Trunk

Item	Units	Wanjia- zhai	Long- kou	Tian- qiao	Qian- beihui	Qikou	Jundu	Sanjiao	Longmen	Total
Area of river basin	10,000 km <sup>2</sup>	39.5	39.7	40.4	40.9	43.1	43.3	43.8	49.7	—
Normal high water level	meters	980	898	834	810	774	662	635	585	—
Lowest water level during rainy season	meters	948	890	830	798	726	654	627	540	—
Total reservoir capacity	100 million m <sup>3</sup>	9.73	1.6	0.7	3.5	96.2	1.4	0.9	125.2	—
Regulation capability		Seasonal	Daily	Daily	Daily	Seasonal	Daily	Daily	Seasonal	—
Maximum head	meters	85	40	20	28	109	25	17	193	—
Guaranteed output	10,000 kWh	13	5.1	2.9	4.5	19.3	4.5	2.7	41.8	93.8
Installed generator capacity	10,000 kW	100	32	12.8	26	90	25	17	150	452.8
Annual electricity output	100 million kWh	27.5	12.8	6.1	9.8	35.3	10	6.6	59.4	167.5
Hours of utilization	hours	2750	4000	4760	3770	3930	3980	3860	3960	—
Maximum dam height	meters	90	47	42	47	117	38	37	206	—
Flooded cultivated land	mu	3400			5600	53100	1200	2400	27500	—
Relocated population	persons	2500			7000	40000	2200	4200	8100	—

NOTE: In the table, Wanjiazhai, Qikou and Longmen are high dam programs.

12,539

CSO: 4013/156

## HYDROPOWER

### FIFTEEN POWER STATIONS PLANNED FOR UPPER COURSE OF HUANG HE

OW261706 Beijing XINHUA in English 1608 GMT 26 Sep 85

[Text] Xi'an, 26 Sep (XINHUA)--China will establish 15 new hydroelectric power stations on the upper reaches of its second longest river--the Huang He.

Located on the 15 gorges between Longyang gorge in Qinghai Province and Qingtong gorge in the Ningxia Hui Autonomous Region, the stations will have a combined generating capacity of 12.4 million kW. They will generate 50 billion kWh of electricity annually, according to local authorities.

Construction of the Longyang gorge station, which is designed to have a generating capacity of 1.28 million kW, is under way. It will generate about 6 billion kWh annually when it is completed in 1987; 10 stations will be completed by 2010.

There are already four hydropower stations--Liujia gorge, Yanguo gorge, Bapan gorge, and Qingtong gorge stations--on the upper reaches of the river. They provide Qinghai, Gansu, and Shaanxi provinces and the Ningxia Hui Autonomous Region with electricity.

The reservoirs of these power stations have a combined holding capacity of 6.5 billion cubic meters, which irrigate 1 million hectares of land, local authorities reported.

Now 11 high-tension power transmission lines have been put up to carry electricity to cities and industrial zones of the provinces along the river.

There were no power stations on the 5,464-kilometer-long river before liberation in 1949.

CSO: 4010/3

# HYDROPOWER

## STATUS OF SMALL-SCALL HYDROPOWER AS OF MID-1985 REVIEWED

Beijing ZHONGGUO SHUILI [CHINESE WATER CONSERVATION] in Chinese No 8, 15 Aug 85  
p 29

[Table]

Place	Newly added installed capacity		Output (10,000 kwh)
	Number	Capacity (kw)	
National total	349	135,874	1,019,627
Beijing City	-	-	2,000
Hebei Province	2	1,600	4,000
Shanxi Province	-	-	5,022
Nei Monggol	-	-	2,661
Liaoning Province	-	-	4,200
Jilin Province	-	-	11,000
Heilongjiang Province	3	1,700	4,000
Jiangsu Province	-	-	2,000
Zhejiang Province	23	5,463	66,000
Anhui Province	5	2,866	7,699
Fujian Province	50	15,000	108,000
Jiangxi Province	35	3,872	55,099
Shandong Province	-	-	700
Henan Province	1	825	17,200
Hubei Province	4	10,860	41,800
Hunan Province	6	10,475	134,308
Guangdong Province	52	26,380	160,000
Guangxi Autonomous Region	20	14,552	89,345
Sichuan Province	50	30,000	175,000
Guizhou Province	9	6,000	30,000
Yunnan Province	4	2,841	52,631
Xizang Autonomous Region	-	-	7,162
Shaanxi Province	80	1,916	6,800
Gansu Province	2	245	10,000
Qinghai Province	-	-	7,000
Xinjiang	3	1,279	23,000

CSO: 4013/6

## HYDROPOWER

### SMALL HYDROPOWER PROJECTS BRING ELECTRICITY TO MOUNTAIN COUNTIES

Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 14 Sep 85 p 3

[Summary] Zhejiang's Xinchang County, one of 100 pilot project counties targeted for rural electrification throughout the nation, is vigorously developing its rich mountain hydraulic resources. In the last several years 223 medium and small-scale hydropower stations have been constructed along with the building of reservoirs; installed capacity is more than 30,000 kilowatts for a yearly power output of 90 million kilowatt-hours. This has played a major role in developing the economy of the mountain areas and in improving the standard of living of the people here. Today, there is electricity available throughout the area and more than 98 percent of the villages and peasant households have electricity. Good crops were assured in more than 60 percent of the acreage of the county regardless of weather conditions and over the past several years some 1,300 village enterprises have been set up.

Fujian's Guangze County is one of the nation's pilot project counties for rural electrification, and after more than 2 years of effort, more than 25,000 of the county's households in towns and in the countryside use electricity. Electricity is supplied to 97 percent of all households, annual per capita use of electricity is 280 kWh and 20.6 percent of all peasant households use electricity for cooking. These and other figures meet or exceed the State Council's targets for rural electrification. Guangze County is in a mountainous region and has abundant hydropower resources. The county currently has more than 175 medium and small-sized hydropower stations, and each small town has a hydropower station with a capacity greater than 300 kW. Total investment in these hydropower stations amounted to more than 25 million yuan of which more than 13 million yuan was raised from collectives or individuals. The total installed capacity of the county's power plants now exceeds 15,000 kW and annual electricity production is 43 million kWh. The development of small hydropower stations has led to great changes in Guangze County's economic construction and cultural life. The energy needs of rural and small town industries have basically been met.

CSO: 4013/6

## HYDROPOWER

### BRIEFS

SHUIFENG EXPANSION BEGUN--After 2 years of preparations, Liaoning Province on 25 September began to expand the Shuifeng power station on the banks of the Yalu Jiang. The power station, located at Lagushao Village Kuandian County, on the lower reaches of the Yalu Jiang, is operated by both China and the DPRK. The expansion project comprises the work of opening up a diversion channel 1,508 meters long along the mountain ridge above the Shuifeng power station on the Chinese side and the task of installing two turbogenerators of 75,000 kilowatts at the end of the new channel. The construction of the project is being undertaken by the Chinese side. After completing the construction of the project in 1988, the Shuifeng power station will support the northeast power grid by increasing its power supply by 400,000 kilowatts. [Text] [Shenyang Liaoning Provincial Service in Mandarin 1030 GMT 26 Sep 85 SK]

HUNAN SMALL-SCALE HYDROPOWER--To date, Huaihua Prefecture has built 1,459 small hydroelectric power stations with a total installed capacity of 156,000 kilowatts. The prefecture has also built a regional electric power grid and has correspondingly set up a small hydroelectricity company to carry out unified control. In 1984, the prefectural and county electric power grids generated some 440 million kilowatt hours and 58 percent of peasant households had electricity. The electricity output in the first 8 months of this year was 10 percent more than in the same period last year. [Text] [Changsha Hunan Provincial Service in Mandarin 1100 GMT 25 Sep 85 HK]

XIAXIKOU UPDATE--The first stage of the Xiaxikou hydropower station project in Fujian Province has been completed 8 months ahead of schedule. As of March this year, the Minjiang Bureau of Engineering under the Ministry of Water Resources and Electric Power, which is in charge of developing this project, had completed about 400,000 cubic meters of earth work. On 14 August the Bureau held a meeting to mark the completion of the first stage of the project and the beginning of the second stage. At the meeting, four advanced units and 105 advanced individuals were commended for their meritorious services. [Summary] [Fuzhou Fujian Provincial Service in Mandarin 1130 GMT 19 Aug 85]

HEILONGJIANG SMALL-SCALE STATIONS--To date Heilongjiang Province has built some 60 small hydropower stations with a total capacity of 50,000 kilowatts. A half of these stations are capable of generating power all year round. These small hydropower stations generated 128 million kWh of electricity last year and 90 million kWh in the first half of this year. Another nine stations are under construction in the province. Their total capacity will be 25,000 kilowatts. [Summary] [Harbin Heilongjiang Provincial Service in Mandarin 1000 GMT 10 Aug 85 SK]

JIANGXI SMALL-SCALE STATIONS--The total installed capacity of Jiangxi Province's small hydroelectric power stations today has exceeded 540,000 kilowatts. These small power stations generate 1.12 billion kWh of electricity annually, providing over 60 percent of the electricity consumed in the rural areas. [Excerpts] [Beijing Domestic Service in Mandarin 1100 GMT 22 Jul 85 OW]

YUNNAN SMALL-SCALE HYDROPOWER--During the period of the Sixth Five-Year Plan the province rapidly developed the small hydropower industry. By the end of 1984, the installed capacity of the province's small hydropower industry was 680,000 kilowatts, an increase of 220,000 kilowatts over 1980. The province's annual generated power for 1984 was 1.6 billion kilowatt-hours, an increase of 100 percent over 1980. [Summary] [Kunming Yunnan Provincial Service in Mandarin 2300 GMT 29 Sep 85 HK]

CSOL 4013/171



## THERMAL POWER

### SHENTOU 200MW UNIT BEGINS OPERATION

HK251535 Beijing XINHUA Hong Kong Service in Chinese 1502 GMT 24 Sep 85

[Report by Cui Luozhe [1508 3157 0772]

[Text] Taiyuan, 24 Sep (XINHUA) -- A 200,000-kilowatt generating unit has been completed and was commissioned today of the Shentou Power Plant in the northern part of Shanxi Province, China's coal energy base. It has begun to supply electricity to the Beijing, Tianjin, and Tangshan areas.

Being the largest thermal power plant in Shanxi Province and only just over 20 kilometers away from the large Pingshuo Opencut Coal Mine which is jointly run with Chinese and U.S. capital, Shentou Power Plant is connected with the northern section of the Datong-Fenglingdu Railroad and the Datong-Taiyuan highway, and is in an ideal place to build a large-scale pit-mouth power station.

At present, the installed capacity of this power plant has reached 750,000 kilowatts. The generating unit which was formally connected to the power grid and put into operation today is the first generating unit of the three-phase project of this plant to be commissioned. In the three-phase project, a total of four generating units will be installed, with a total capacity of 800,000 kilowatts. When completed in 1987, all the electricity generated will be transmitted to the Beijing, Tianjin, and Tangshan areas.

The second 200,000-kilowatt generating unit of the three-phase Shentou Power Plant project is being installed, and is expected to be finished and commissioned by the end of this year.

CSO: 4013/2

## THERMAL POWER

### BRIEFS

TAIZHOU UPDATE--The No. 3 125,000 kW generator of the Taizhou power plant in Zhejiang Province formally began generating electricity on 12 July. The generator was built in a joint effort involving Zhejiang Province and the Ministry of Water Resources and Electric Power; work began in March 1983. The putting into operation of the unit will help alleviate the tense power situation in the East China Power Grid. [Text] [Yinchuan NINGXIA RIBAO in Chinese 8 Aug 85 p 3]

YONGAN UPDATE--Fuzhou, 17 September (ZHONGGUO XINWEN SEH)--The third set of generators of the Yongan Thermal Power Plant--the largest one in Fujian Province--yesterday completed a 72-hour test of on-line operation and worked normally. The test showed that the set of generators measures up to state standards. Thus, the entire construction project of the power station was completed. All three sets of generators at this power plant will be put into operation by 1 October 1985. Previously, Fujian Province had a shortage of electricity, and hydropower alone could not meet the needs of industrial and domestic use. Therefore construction of the Yongan Power Plant, which has a generating capacity of 350,000 kilowatts, was begun in July 1981 as one of the key projects in Fujian Province. The first two sets of generators were put into operations in October 1984 and August 1985 respectively. [Text] [Beijing ZHONGGUO XINWEN SHE in Chinese 0948 GMT 17 Sep 85 HK]

HENAN SMALL PLANTS--Zhengzhou, 4 Aug (XINHUA)--Henan has fully utilized coal resources to develop local small thermelectric power plants. At present, the province has 33 local small thermelectric power plants with installed capacity totalling 410,000 kW and electric energy production totalling 1.97 billion kWh per annum. These small thermelectric power plants are built in out-of-the-way places where there are coal resources but power supply is not guaranteed by the main power network. [Summary] [Beijing XINHUA Domestic Service in Chinese 0030 GMT 4 Aug 85]

SHUANGYASHAN UPDATE--Work on the main portion of the Shuangyashan power plant begins today. The Shuangyashan power plant project is a major national project and a very important construction item for Heilongjiang Province under the Seventh 5-Year Plan. This power plant is a pit-mouth power plant with a design installed capacity of 800,000 kilowatts. The project is to be built in two stages with two 200MW generators being installed in each stage. [Text] [Harbin HEILONGJIANG RIBAO in Chinese 2 Jul 85 p 1]

SMOOTH PROGRESS OF LEIYANG PROJECT ASSURED--The Provincial CPC Committee and government have strengthened their leadership over the Leiyang power plant, a priority project. They have actively and effectively settled and solved problems arising in the construction, thus ensuring the smooth progress of the project. The Leiyang power plant is a priority project. The installed capacity of phase 1 of the project is 400,000 kW. The Provincial CPC Committee and government have been extremely concerned over the project. Since the commencement of the project, principal leading comrades of the Provincial CPC Committee and government have successively inspected the site and given specific instructions on project progress and management of the project. They demanded that the first generating unit be put into operation in 1987. The provincial government has also held meetings with the relevant departments to specifically discuss such policy-related problems as setting a unit price for acquiring land and resettling people who are displaced. In accordance with instructions of the Provincial CPC Committee and people's government, the provincial construction committee, the provincial priority projects office, and the provincial commerce bureau held on-the-spot routine office work meetings of the relevant departments at the site to settle and solve problems arising in the construction. [passage omitted] [Excerpt] [Changsha Hunan Provincial Service in Mandarin 1100 GMT 21 Aug 85 HK]

NEW LIAONING 100 MW PLANT--Construction of a state-approved key project--the thermal power plant of the Benxi Iron and Steel Company in Liaoning--started today. With a total investment of 206.99 million yuan, the power plant will be installed with two units of 50,000-kilowatt power generating equipment, four 220-ton high-temperature, high-pressure boilers, and other auxiliary equipment. Each boiler will be equipped with a highly efficient electric dust remover for pollution control to make sure that the power plant will not discharge coal ash. The project is expected to be completed and put into operation by the end of 1988. It may generate 721 million kWh of electricity and provide 151 million kilocalories of heat every year. [Text] [Shenyang Liaoning Provincial Service in Mandarin 1030 GMT 3 Sep 85 SK]

## COAL

### COAL MARKET IN FIRST HALF OF 1985 EXAMINED

Beijing RENMIN RIBAO in Chinese 24 Jul 85 p 3

[Article: "Adequate Supplies, Stable Markets, Increased Reserves--Zhao Weichen [6392 5898 2052], Vice Minister of the State Economic Commission, Discusses the Coal Market Situation in the First Half of 1985"]

[Text] Zhao Weichen, vice minister of the State Economic Commission, told visiting reporters in Tianjin that coal supplies were adequate, markets were stable and reserves had increased during the first half of 1985. Some regions have cooperated in lowering coal prices outside of plans and a good situation not seen in many years has appeared.

Zhao Weichen said that the good situation in market supplies of coal this year are apparent mainly in the following three areas:

First, China's coal supplies consistently have been in a state of shortage, especially in such economically developed coastal areas as Shanghai, Jiangsu, and Zhejiang. Emergencies due to inadequate coal supplies have been frequent. These conditions have been alleviated somewhat this year and Shanghai's coal reserves have increased to 600,000 tons. Some cities already have begun shipping coal for the winter. Second, the four large Northeast, North, East and Central power grids are important electric power production base areas in China. Coal shortages in the past often meant that some of the power plants had only a few days reserves of coal used for production. Coal reserves in these four major grids in China had reached 3.8 million tons by the end of June this year, an increase of 1.25 million tons over last year. Market-use coal reserves nationwide increased by 5.15 million tons compared to 1984. Third, some areas have lowered coal prices through cooperating outside of the plan. The highest cooperation delivered coal price in several cities reached 180 yuan per ton last year, and has dropped to around 90 yuan per ton this year (including shipping costs).

Zhao Weichen said that the main reason for the improved situation in coal supply markets this year is that the state has integrated macro-control and micro-dynamism rather well. Coal used for coordinated economic development in all regions has come under state transportation plants, and dispatching, plan inspection and management have been strengthened. Single accounts are being kept for production, distribution and transportation, which has transformed the disjointed situation of the past where production exceeded distribution and where distribution exceeded transportation. It deserves special mention that, following party consolidation, the Ministry of Coal Industry, Ministry of Railways,

Ministry of Communications, the Production Dispatch Bureau of the State Economic Commission and other departments have strengthened coordination, integrated closely and made an obvious change in working styles. Coal output has continued to increase and railways, water routes and highways are advancing together. The role of water routes and highways now is beginning to grow.

Zhao Weichen said that there also are areas with imbalances in coal shipments and supplies and a small number of areas where the problem of insufficient supplies and transportation still have not been solved. Based on plans, those who have insufficient supplies and transportation in the future must supplement them themselves. The more than 700,000 tons of coal stockpiled in Shanghai harbor now are owned by the three large Shanghai, Jiangsu, and East China power grids.

Related departments are adopting urgent measures to ship it out.

Finally, Zhao Weichen emphasized that based on past experience, early arrangements should be made for coal supplies, distribution and transportation for the winter and for next year, and that this is an extremely important link.

12,539

CSO: 4013/162

## COAL

### STATE-OWNED COAL MINES BOOST OUTPUT

OW211124 Beijing XINHUA in English 0738 GMT 21 Sep 85

[Text] Beijing, 21 Sep (XINHUA)--The output of China's state-owned coal mines rose by more than 24 million tons between January 1984 and June 1985, compared with the previous one-and-a-half years, while the work force was reduced by 310,000 in this period.

The Ministry of Coal Industry attributed this success to the responsibility system practiced since last year. Under this system the state allocates an amount of wages to each mine in terms of tonnage excavated. Therefore, the higher the output, the higher the wages; and the fewer the miners, the less there are to share the total amount.

In the past, coal mines got a certain amount of wages from the state according to the number of the miners they employed, irrespective of their output. This resulted in low productivity and limited income for the workers.

"A bigger share of the pie" for everybody has stimulated enterprises to improve efficiency and output with less people.

Those having left the pits include the disabled and retired. Others have been transferred to service companies or plants affiliated to the mines.

About 80 percent of the state-owned mines have adopted the responsibility system, according to the ministry.

CSO: 4010/3



## COAL

### STATE COUNCIL CALLS FOR DEVELOPMENT OF URBAN COAL GAS SUPPLY

Yinchuan NINGXIA RIBAO in Chinese 22 Jul 85 p 3

[Article: "Accelerate Development of Urban Coal Gas Industry--State Council Transmits Report From Ministry of Urban and Rural Construction and Environmental Protection"]

[Text] The State Council Office recently transmitted a report from the Ministry of Urban and Rural Construction and Environmental Protection concerning the acceleration of development of the urban coal gas industry and informed all localities and related departments that urban coal gas construction should become the order of the day in urban construction and that it should be treated as a principle in major technical policy questions.

The report that the Ministry of Urban and Rural Construction and Environmental Protection submitted to the State Council said that coal gas is a primary energy resource in modern urban life. Currently, about 80 percent of China's urban population still uses small coal stoves for cooking. The energy resource utilization rate is low and there is serious environmental pollution. Furthermore, coal gas supplies cannot meet demand, which already has directly influenced the utilization of industrial production capacity and improvements in product quality. For this reason, accelerated development of urban coal gas should be treated as an important question in urban economic development from the Seventh Five-Year Plan to the end of this century, and must be considered earnestly and resolved.

The preliminary idea is to increase the population using gas to 50 million people by the year 1990 and to achieve a gas utilization rate for the urban population of more than 40 percent. The gas utilization rate in key cities should surpass 60 percent. The three municipalities of Beijing, Tianjin and Shanghai should achieve basic coal gasification. The following problems must be solved to achieve this:

Urban coal gas construction should adhere to the development principle of multiple gas sources, multiple routes, adaptation to local conditions and rational utilization of energy resources. Short-term development should concentrate on municipalities, provincial government seats, coastal cities opened to the outside, scenic and tourist cities, key environmental protection cities and cities with good coal gas energy resource conditions.

Management and administration systems in coal gas enterprises should be reformed.

Multiple gas sources should be opened up.

Initiative should be motivated in all areas to collect capital from many sources and have everyone manage coal gas.

All related departments should strive to assist in construction of the coal gas industry and actively provide gas sources and gas-making materials to contribute to development of the coal gas industry. People's governments in all provinces, autonomous regions and municipalities should strengthen leadership of urban coal gas construction, coordinate work in all areas well and use comprehensive urban plans as a foundation to implement unified planning, construction and management of coal gas construction and supply.

12,539

CSO: 4013/162

## COAL

### HEBEI PRODUCTION MEETS TARGETS OF SIXTH FIVE-YEAR PLAN

SK010549 Shijiazhuang Hebei Provincial Service in Mandarin 2300 GMT 16 Sep 85

[Text] Our province has done well in implementing the targets of the coal industry in the Sixth Five-Year Plan. The province is expected to fulfill or overfulfill most targets of the coal industry in the Sixth Five-Year Plan. In the first 4 years of the Sixth Five-Year Plan period, the province had produced 140 million tons of raw coal, overfulfilling the plan by 6.33 percent and fulfilling the total raw coal output target in the Sixth Five-Year Plan by 83.6 percent. This was an increase of 5.4 percent over the corresponding period of the Fifth Five-Year Plan. Of this, the collieries whose products are distributed under the provincial unified plan fulfilled the raw coal output plan by 101.1 percent in the first 4 years of the Sixth Five-Year Plan period, showing a yearly average increase of 3.1 percent. Of the province's total coal production, production of local collieries accounts for 42 percent and continues to increase.

During the Sixth Five-Year Plan period, collieries whose products are distributed under the provincial unified plan have a plan for building eight pairs of coal pits with a production capacity of 6.87 million tons of coal. So far, five pairs of coal pits are being constructed, while the other three pairs have been put into production. The newly added production capacity is 2.91 million tons of coal.

Since 1981, the provincial coal industrial front has been based on tapping potential, and tried every means possible to increase the varieties of products and to develop the production of a diversified economy, thus its economic results continue to increase year after year. In the first 4 years of the Sixth Five-Year Plan period, the coal industrial front realized 19.03 million yuan of profits, overfulfilled the plan by 77.6 percent, and prefulfilled the assigned profit target in the Sixth Five-Year Plan by 1 year.

CSO: 4013/8

## COAL

### NINGXIA COORDINATES COAL PRODUCTION AND TRANSPORT

Yinchuan NINGXIA RIBAO in Chinese 16 May 85 p 1

[Article: "The Contradiction Between Production and Shipping in Ningxia's Unified Distribution Coal Mines Begins to Improve--Coal Transport During the First Quarter of 1985 Exceeded Plans by Over 70,000 Tons]

[Text] The contradiction between production and transportation of Ningxia's unified distribution coal basically has been alleviated. The production-shipping and supply-demand contract completion situation from January to April of 1985 has been excellent and a good situation seldom seen in more than a decade has appeared.

According to statistics, the state's top-shelf directive transportation plan for unified distribution coal in Ningxia from January to April of this year was 3,342,240 tons. Actual railway shipments reached 3,416,553 tons, a surplus of 74,313 tons and an increase of more than 238,000 tons over total shipments of unified distribution coal for the same period in 1984. Coal losses have been reduced greatly by the balance between production and transportation, and there have been obvious improvements in enterprise economic results. Total losses in unified distribution coal mines in Ningxia during the 4-month period were 5.45 million yuan less than state plans. The good linkages between production and transportation also has improved the rate at which supply-demand contracts have been honored, which has led to benefits for society.

Because rail transportation in Ningxia could not meet the demands of production for such a long period in the past, a great deal of raw coal was lost. Although there have been several transportation breakthroughs, the problem remains basically unsolved. To transform disassociated coal production, distribution and transportation plans and the prominent contradiction between output, demand and shipping, Ningxia has gone a step further in implementation of the State Council's "Program for Reforms in Coal Ordering and Allocational Shipment Work" to develop a single plan for coal production, distribution and transportation as well as a comprehensive balance between coal mines, users and railways. They have signed contracts and taken on joint economic responsibility. Railways, mines and transportation are cooperating to open up a new situation in coal allocation and shipment. Coal transportation distances in Ningxia are short and economic results are

low. The Yinchuan Railroad, however, has proceeded from the overall situation and paid attention to overall benefits to society. They have drawn up meticulous transportation plans and are actively exploiting shipping potential to make arrangements for coal cars as quickly as possible, and they are striving in every way to transport coal according to contracts and plans. Ningxia's entire coal system from top to bottom has strengthened shipping and marketing organs and been active in cooperating with the railroads and mines. The Quarry and Coal Mine Service Bureau has developed speed and quality competitions in car loading throughout its area and implemented a system of rewards for surplus loading and shipping. This has motivated the initiatives of employees and improved car loading efficiency and quality. According to statistics, the bureau's car loading schedule rate was 95.9 percent from January to April, which guaranteed a balance between production and transportation.

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CSO: 4013/163

## COAL

### DEVELOPMENT OF ANHUI'S LOCAL COAL MINES URGED

Hefei ANHUI RIBAO in Chinese 7 May 85 p 3

[Article by Liu Hongsheng [0491 7703 3932], deputy director of the Anhui Provincial Coal Bureau: "There Should Be Substantial Development of Anhui's Local Coal Mines"]

[Text] Anhui has extremely rich coal resources, excellent reserve conditions, a complete variety of products and excellent coal quality, with reserve amounts second in East China. Anhui has a total area of 139,000 square kilometers, 17,950 kilometers or 12.9 percent of which has coal. Coal resources can be found in 9 of the province's 15 cities and in 37, or 55.4 percent, of its 60 counties. Anhui had only 3 coal mines in the Huainan mining region just after Liberation. Production in 1949, even including small coal pits, was only 1.15 million tons of raw coal. After more than 30 years of construction, the two 10-million-ton Huainan and Huaibei mining regions and some local coal mines have been completed. The Huainan and Huaibei mining regions now have 21 producing mines with a design capacity of 17.66 million tons. There are 22 local state-run mines. Anhui produced 25.24 million tons of raw coal in 1983, a more than 22-fold increase over 1949. It has turned over 2.34 billion yuan in taxes and profits, created wealth, trained personnel, accumulated experience and made positive contributions to socialist construction. In recent years, however, under the guiding ideology of "unified distribution management of large mines, intra-provincial management of small mines," attention was focused on southern Anhui, with its limited resources, poor coal quality and bad conditions. The consequence was bad investment results and slow development. There was no alleviation of the situation of supply not meeting demand in Anhui. The attention of the Anhui CPC Committee and government in recent years has, however, brought about new developments in recent years. First, there has been a strategic shift in our guiding ideology, which involves a shifted investment and production focus from southern Anhui to Huainan and Huaibei. Some 140 million yuan was invested to build five key shaft mines and they were producing 6.03 million tons of raw coal by 1983, which shows the superiority of investments in Huainan and Huaibei. Based on the coal industry development plan formulated for Anhui by the provincial Coal Bureau, the Anhui Coal Bureau has made spirited reforms and implemented the principle of "the state, collectives and individuals, the big, medium and small, advancing together" and of "allowing the water to run" [making use of resources]. It has transferred



authority for examination and approval of small coal pits down to the prefectural, city and county levels, and it has adopted a series of measures to encourage the development of small coal pits. This has motivated the productive initiative of all employees on the coal battlefront in Anhui, and they achieved planned coal output of 3 million tons 1 year and 52 days ahead of time. They have leapt to the first platform in Anhui's coal development plans.

The tasks faced by the many employees on Anhui's coal battlefront in 1985 are extremely difficult ones. The coal output task for this year is 3.5 million tons, and we are striving to reach 4 million tons. To complete this glorious task, we must be earnest in economic reforms, exploit potential and transform old mines, strive to concentrate on building new mines and achieve safe production.

Coal is one of Anhui's economic advantages. Those of us in coal production departments certainly must make full use of this advantage to produce more coal and make a contribution to accelerating the building of Anhui into economically developed province!

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CSO: 4013/163

COAL

SHANXI EXHIBITION AIMED AT FOREIGN MACHINERY MANUFACTURERS

OW020408 Beijing XINHUA in English 0251 GMT 2 Oct 85

[Text] Taiyuan, 2 Oct (XINHUA)--A coal machinery exhibition will be held this December in Taiyuan, the capital of the major Chinese coal producing province, Shanxi.

An official of the provincial foreign economic relations and trade department said that the exhibition will run from 4-9 December, sponsored jointly by the Shanxi branch of the China Council for the Promotion of International Trade and a Hong Kong company.

More than 20 countries and regions, including Britain, France, Japan, Australia, Federal Germany, and the U.S., are invited to take part in the exhibition.

The machinery on display will include excavating, tunnelling, transporting, exploring, and other coal processing machinery.

The exhibition will be the first of its kind ever held in Shanxi, the official said. It will help establish business relations between Shanxi and foreign enterprises in this field.

According to the coal management of the province, Shanxi uses one third of the large coal excavating equipment imported into China. This equipment produced one-sixth of the 187 million tons of coal excavated in Shanxi last year.

Now Shanxi is negotiating with Britain, Federal Germany and other countries to import more equipment.

CSO: 4010/5

## COAL

### BRIEFS

**BIG SICHUAN PROJECT APPROVED**--The development of a rich Sichuan coal field--the Yunlian Coal Field--was recently approved by the State Planning Commission. Beginning in 1977, the 141st and 135th drilling teams of the Sichuan Coal Field Geology Company carried out general surveys, detailed surveys, and then thoroughly exhaustive surveys to verify reserves of some 2.7 billion tons that could be extracted at the rate of 8 million tons a year. [Excerpt] [Chengdu SICHUAN RIBAO in Chinese 8 Aug 85 p 1]

**SLURRY PIPELINE TEST CENTER**--A key project of the state's Sixth Five-Year Plan--a coal slurry pipeline test center--was checked and accepted by the state today and formally went into operation. Coal is China's main energy resource, and the fact that coal transportation is insufficient directly affects the development of the national economy. Thus, efforts to develop a long-distance coal slurry pipeline are extremely significant for China. For this reason, in 1981 the State Science Commission and the Ministry of Coal Industry decided to establish a coal slurry test center at the Coal Science Research Institute's Tangshan Branch Institute and provide a scientific basis so that China could begin to build an industrial coal slurry pipeline as early as possible. After the workers and relevant units of the Coal Science Research Institute's Tangshan Branch Institute exerted great effort, the test center was completed in the middle of August 1985. The center includes a system for breaking up the coal into a liquid form, pumping it through a pipeline, and separating the liquid from the coal. The center also uses advanced instruments and equipment from home and abroad and has developed a system to monitor the process by computer. The State Science and Technology Commission and the Ministry of Coal Industry convened an acceptance conference for putting this project into operation. The Chinese and foreign experts who attended the conference felt that the construction of the coal slurry pipeline test center was on a large scale, the testing functions of the center are complete, the technical level is advanced and that the test center has reached current international levels. [Text] [Beijing RENMIN RIBAO in Chinese 13 Aug 85 p 2]

**NEW LIAONING FIELD**--Shenyang, 6 Aug (XINHUA)--The Dongbei - Nei Monggol Coal Field Geological Department recently discovered a new coal field south of Shenyang with proven deposits of more than 300 million tons. The coal field is 42 square kilometers in area. The proven deposits include good quality coking coal and coal for daily use. [Text] [Beijing XINHUA Domestic Service in Chinese 0035 GMT 6 Aug 85]

HUAIHE BASIN COAL CENTER--Hefei, 7 September (XINHUA)--The Huaihe Basin, covering 270,000 square kilometers, is to become the largest coal-producing base in the central part of China. The known coal deposits distributed in the valley, running through the four provinces of Shandong, Henan, Anhui and Jiangsu, reach 50 billion tons, and the prospective deposits are estimated at 100 billion tons. The coal output of the basin came to 85 million tons last year, and the installed capacity of coal field power stations was 5 million kW. Five coal fields, including Pingdingsham, Huainan, and Huaibei, are being developed in the basin, and the mines are expected to produce 150 million tons of coal annually by the end of this century. The basin is close to the economically developed areas in China. [Text] [Beijing XINHUA in English 0644 GMT 7 Sep 85 OW]

SHANXI OUTPUT--Taiyuan, 24 Aug (XINHUA)--Coal output in Shanxi, China's leading coal producer, came to 102 million tons in the first 7 months of this year. "Coal produced in peasant-run mines is expected to equal that coming from state-owned mines by the end of this year," said Li Menggen, director of the provincial bureau of township enterprises. In the first 7 months it amounted to 49 percent. The annual coal target for Shanxi by the end of this century is 400 million tons. In recent years, Shanxi peasants have opened about 4,100 small mines. Since 1981, the provincial government has granted 65 million yuan in low-interest loans annually for technical transformation of key peasant-run mines and eight coal terminals. The average output of small peasant-run mines has increased 14 million tons over the past 2 years. /Text/ /Beijing XINHUA in English 1324 GMT 24 Aug 85/

CSO: 4010/169

## OIL AND GAS

### BIG INVESTMENTS PAYING OFF FOR CHINA, FOREIGN PARTNERS

OW271432 Beijing XINHUA in English 1326 GMT 27 Sep 85

[Text] Beijing, 27 Sep (XINHUA correspondent Wang Jinhe)--Six wells, each producing a daily average of more than 7,000 barrels of crude oil, have been sunk offshore since the start of Sino-foreign offshore oil exploration and development in 1979, according to the China National Offshore Oil Corporation [CNOOC].

In addition, two wells, each producing more than 1 million cubic meters of natural gas a day, have been drilled, CNOOC added.

There will be one new oil-gas field going into operation every year during the Seventh Five-Year Plan period (1986-1990).

The 11.5-square-kilometer Chengbei oil field in the Bohai Sea, a Sino-Japanese joint undertaking, will go on stream officially beginning 1 October. The oil field has an estimated reserve of 175 million barrels, and the peak annual output may reach 2.8 million barrels, CNOOC said.

It has been decided to develop the Bozhong 28-1 oil field in the same area, as five other structures have reported oil-gas flows, and feasibility studies are now under way, the Chinese company said.

In the Beibu Gulf of the South China Sea, nine of 21 exploratory wells have struck oil and gas, and two of them reportedly produce more than 7,000 barrels of crude a day each. The Wei 10-3 oil field, which is expected to pump some 7 million barrels a year, is to go into production next year, CNOOC said.

CNOOC and its partner, Atlantic Richfield Company [ARCO] of the United States, have found a 55-square-kilometer natural gas field south of Hainan Island, with an estimated reserve of more than 90 billion cubic meters of natural gas. CNOOC and ARCO are to sign an agreement in Beijing on the development of the field tomorrow.

In the Pearl River estuary of the South China Sea, seven wells have reported oil-gas flows, four of them being high-yield wells with two producing more than 7,000 barrels a day each.

From 1980 through July this year, CNOOC said, nearly 40 of the more than 100 wells drilled in the delta struck oil and gas.

In the past 5 years, the Chinese oil company said, its foreign partners have invested a total of 1.62 billion U.S. dollars in China's offshore oil projects.

Among the more than 30 partners from ten countries are internationally well-known oil firms including Exxon, Texaco, Chevron, BP, Shell, Agip, Phillips, Total, and the National Oil Company of Japan [JNOC].

China has a total of 1.3 million square kilometers of continental shelf with an average depth of 200 meters. Both Chinese and foreign petro-geologists hold the view that the Bohai Sea, Yellow Sea, East China Sea, the Pearl River estuary, the Beibu Gulf, and the Yingge Sea of the South China Sea (an aggregate area of 620,000 square kilometers) are six large, thick sedimentary basins with many structures and good oil-generating and entrapping conditions.

Between 1980 and 1983, including the period of the first round of bidding, China and foreign consortia signed 23 contracts covering an offshore total of 93,263 square kilometers.

For the second round of bidding, which began in November last year, China designated a total of 108,300 square kilometers in 22 blocks for foreign oil firms to make their bids; offers have come in from 23 companies from 10 countries.

Inviting foreign businesses to join in China's offshore oil undertakings is the country's firm policy, said CNOOC president Qin Wencai. China will adopt more flexible policy measures in the second round of bidding and encourage the development of small and medium-sized oil fields by modifying fiscal terms, he added:

"Later on, we shall proceed with more rounds of bidding," Qin Wencai said.

CSO: 4010/3



## OIL AND GAS

DAQING EXPECTED TO PRODUCE 55 MILLION TONS IN 1985

OW071128 Beijing XINHUA in English 1117 GMT 7 Oct 85

[Text] Harbin, 7 October (XINHUA)--Daqing, China's biggest oilfield, expects to produce 55 million tons of crude this year, local officials told XINHUA.

On 2 September the oil field met its 10-year production target of 500 million tons of oil. The task, set in 1976, was accomplished 4 months ahead of schedule.

Development of the oil field started in 1960. By 1976, it was yielding 50 million tons annually. Daqing administrators decided at that time to try to keep this high level of output stable for 10 years.

There were doubts among some of the managers that this could be done, but the oil field not only stabilized output, but also increased it. In 1984, 53.56 million tons of crude were pumped.

Daqing has 130 different oil-bearing strata. The complicated geological structure is rare in petroleum producing centers.

Scientists at the oil field have developed technology to tap the shallow petroleum layers and this has helped to boost reserves.

Daqing's managers have adopted such measures as locating oil wells in dense clumps and turning natural gushers into pumped wells so as to recover more reserves.

Large-scale construction and overhauling will help stabilize the high output for another 5 years, according to local petroleum experts.

They based their predictions on the fact that the water content of the crude oil is stable and the natural descending rate of the wells is fairly low.

Li Yugeng, head of the Daqing Oil Administration and senior engineer, said sound foundations have been laid in recent years to keep the oil field's annual output up to 55 millions until 1990.

CSO: 4010/5

## OIL AND GAS

### QAIDAM'S OIL RESERVES COMPARED TO THOSE OF SAUDI ARABIA

Hong Kong WEN WEI PO in Chinese 16 Sep 85 p 5

[Text] Chinese economists have revealed that in the Seventh 5-Year Plan period China will accelerate petroleum exploration, focusing on the reforming of old fields. In the Seventh 5-Year Plan, the Shengli oil field will become China's second Daqing with a yearly production of 50 million tons of oil.

Petroleum exploration, whether in the East China Sea or the South China Sea, involves long periods of time and hazards. In the Seventh 5-Year Plan, efforts will be directed mainly to onshore exploration. Petroleum reserves in the northwest are extremely abundant. For example, preliminary exploration findings in the Qaidam Basin indicate that its underground reserves make it comparable to Saudi Arabia. Preparatory work for the development of this basin will be made in the Seventh 5-Year Plan. Today, several tens of thousands of people have been assembled, a situation reminiscent of the 1960's at Daqing.

Chinese economists summed up the anticipated construction in China's Seventh 5-Year Plan: To accelerate the development of the East; make the central portion [of the country] a base for energy resources and raw materials; make preparations for the development of the West.

In other words, the emphasis in developing the East will be on importing advanced technology, to develop high-quality products and technology-intensive products geared to expanding exports and creating a new situation both at home and abroad, thus supporting construction of the central and western portions of the country. The central portion will develop energy resources and raw materials and the western portion will feature the development of energy resources, minerals, agriculture, animal husbandry, etc.

CSO: 4013/6

## OIL AND GAS

### NEW HIGH-YIELD WELL SUNK IN PEARL RIVER ESTUARY

OW291053 Beijing XINHUA in English 1040 GMT 29 Sep 85

[Text] Beijing, 29 Sep (XINHUA)—An oil well recently drilled in the Pearl River estuary in South China's Guangdong Province spouts a daily average of 13,370 barrels of crude oil and 280,000 cubic meters of natural gas, the Chinese Offshore Oil Corporation [CNOOC] announced here today.

The Huizhou 21-1-1 well was sunk by CNOOC and its foreign partner, ACT consortium, which is made up of Agip (Overseas) Ltd. of Italy, and Chevron Overseas Petroleum Ltd. and Texaco Orient of the United States. The well has five oil-bearing strata and the oil is free from hydrogen sulfide, CNOOC said.

The block awarded to the ACT consortium has an area of 3,189 square kilometers. In January this year, the consortium drilled a well that produces about 2,715 barrels of crude a day.

CNOOC announced Tuesday that the Phillips consortium of the United States had also succeeded in sinking a well that pumps out some 14,600 barrels of crude a day. A total of seven wells have struck oil and gas in the Pearl River estuary of the South China Sea, the Chinese oil firm said.

CSO: 4010/3

## OIL AND GAS

### NEW STRIKES RAISE HOPES FOR PEARL RIVER ESTUARY

OW251124 Beijing XINHUA in English 1105 GMT 25 Sep 85

[Text] Guangzhou, 25 Sep (XINHUA)--A new high-output oil well drilled recently in the Pearl River estuary shows that the estuary is an oil and gas rich zone, oil experts here said.

Over the past 2 years, Chinese and foreign technicians have drilled seven high-output oil wells in the Pearl River estuary. This well, Xijiang 24-3-2, drilled by the Phillips consortium of the United States, yields some 2,000 tons or 14,000 barrels a day.

This is the highest yield oil well drilled so far in the area, said Chen Tongtai, general manager of the Nanhai East Petroleum Company.

In addition, four structures rich in oil have been discovered, he added. Three of them are located in the Zhu No 1 depression within a distance of 100 nautical miles off the coast.

"This makes us believe that we have found an oil and gas concentration zone," he said.

Covering 6,000 square kilometers, the zone has an abundance of oil-bearing strata, including lacustrine ones in an area of 2,000 square kilometers.

At present, seven oil-bearing zones with 26 oil-bearing structures have been verified. Half of eight structures drilled now give oil flows and three are high-yielding.

So, said Chen, the three structures might be major oilfields with industrial exploitation value.

The zone is 160 kilometers to 180 kilometers from Hong Kong and less than 300 kilometers from Guangzhou.

Drilling also showed that oil-generating strata also extend to the coast of Guangdong Province.

Among the discoveries are also fine oil and gas storage strata and a 200 to 500 meters-thick stratum which serves as a cover on oil and gas deposits.

Since September 1983, wells have been drilled in only a small fraction of structures in the basin, which covers 147,000 square kilometers, a geologist of the company said. In the eastern part, for example, only 23 out of 200 structures have been explored. The basin, on the northern continental shelf of the South China Sea, is a major area for China's offshore oil efforts. Eight bidding groups formed by 23 foreign firms have obtained rights to explore 12 blocks. Over the past 2 years, they have completed 32,100 kilometers of seismic lines, drilled 35 exploratory wells and confirmed 100 structures in an area of 26,200 square kilometers.

CSO: 4010/3

## OIL AND GAS

### CNOOC, FOREIGN COMPANIES SIGN AGREEMENT ON OFFSHORE GAS

OW280648 Beijing XINHUA in English 0631 GMT 28 Sep 85

[Text] Beijing, 28 Sep (XINHUA)--A large offshore gas field in the South China Sea is designed to produce 3.25 billion cubic meters of natural gas a year beginning 1992, 3 years after it goes into commercial production, it was announced here today.

A 96-kilometer [submarine] pipeline is to be laid from the Yacheng 13-1 gas field in the Yingge Sea to Hainan Island and it will be extended from Hainan Island to Guangzhou and Shenzhen via the Leizhou Peninsula.

A drilling, production, and accommodation platform will be built to ensure a steady gas supply for 20 years, according to an agreement on the development, production and sale of the gas, which was signed by the members of [the] consortium here this morning.

Members of the consortium are the China National Offshore Oil Corporation [CNOOC], Atlantic Richfield Company [ARCO] of the United States, and Santa Fe Minerals Asia, Inc. (now part of the Kuwait National Oil Corp.), which discovered the 55-square-kilometer Yacheng gas field in August 1983. Yacheng has an estimated reserve of more than 90 billion cubic meters of natural gas. It will be the first of its kind to go into production since China started offshore oil and gas exploration in cooperation with foreign businesses in 1979.

CNOOC and the ARCO-led consortium decided to jointly develop the gas field and undertake gas production and the Chinese oil company undertakes the gas utilization projects. CNOOC has set up a company in Guangzhou to buy and sell the gas and is responsible for the construction of the pipeline and power plant. CNOOC and its partners signed a contract to explore and develop Yingge Sea natural gas in September 1982. The first well was drilled in the area in August 1983, and it struck gas deposits with a daily output of 1.2 million cubic meters of natural gas. In September last year, a second well was sunk and produced a reported daily output of 1.83 million cubic meters of natural gas.

State councillor Kang Shien attended the agreement signing ceremony today and later met with and gave a luncheon for ARCO chairman Robert Anderson and other American friends. Also present were Wang Tao, minister of petroleum industry; Zheng Tuobin minister of foreign economic relations and trade; Qin Wencai, president of CNOOC; C. R. Bell, vice-president of Santa Fe Minerals Asia, Inc., Herbert E. Horowitz, charge d'affaires of the U.S. Embassy in Beijing, and leading members of the State Planning Commission and Foreign Ministry.



## OIL AND GAS

### OIL DEPOSITS EXPLORED IN XINJIANG

OW270730 Beijing XINHUA in English 0713 GMT 27 Sep 85

[Text] Urumqi, 27 Sep (XINHUA)--Nearly 10,000 geological workers are now busy exploring petroleum resources in the Tarim Basin in northwest China's Xinjiang Uygur Autonomous Region.

The basin's first gusher went into production in September of last year.

Kang Yuzhu, deputy chief engineer of the Northwest China Petroleum Administration, said there are 18 geophysical prospecting and six drilling teams.

Experts say there may be "considerable" petroleum deposits in the basin, which covers 560,000 square kilometers since they have found five petroleum generating systems in the past year.

A full-scale oil field is now under construction in the southern part of the basin.

Petroleum prospecting is a part of a giant program put forward by the central government to develop Xinjiang, which has an area of 1.6 million square kilometers, one-sixth of China's land mass.

CSO: 4010/4

## OIL AND GAS

### ESTIMATE OF KARAMAY OIL RESERVES INCREASED

OW242002 Beijing XINHUA in English 1845 GMT 24 Sep 85

[Text] Urumqi, 24 September (XINHUA)--Oil reserves verified in the Karamay oil field in the past 4 years are 1.7 times those proved in the past 2 decades, according to the Petroleum Department of Xinjiang Uygur Autonomous Region.

Karamay, ranking fifth in China, yielded 31.5 million bbl of crude oil in 1984. It also produced 12.6 million bbl of refined oil, of which 17 varieties were exported to 8 countries.

Karamay has also developed heavy oil extraction with imported technology and equipment.

Proven heavy oil reserves extend across an area 300 km by 30 km.

The oil field is building a heavy oil refinery with an annual capacity of 1.4 million bbl which is scheduled to go into operation by the end of this year.

CSO: 4010/171

## OIL AND GAS

### NEW CONCEPT IN OIL PROSPECTING STIRS INTEREST

OW240845 Beijing XINHUA in English 0739 GMT 24 Aug 85

[Text] Shijiazhuang, 24 Aug (XINHUA)--Under the guidance of a new concept for petroleum prospecting, a number of high-yield oil wells have been sunk in geological formations formerly regarded as containing no oil.

The new concept, developed in the north China oil fields, holds that oil can be found in any strata with petroleum generating or storage conditions.

In the past, it was generally accepted that the chief source of petroleum existed in the Mesozoic and Cenozoic eras dating back about 200 million years ago, when the climate was warm, lakes and swamps spread everywhere, and various organisms reproduced rapidly.

But in 1975, a drilling team in the north China oil fields found petroleum in a paleozoic formation believed to be 280-600 million years old, 3,200 meters deep, in Renqiu County, Hebei Province.

After studying the new discovery, geologists considered that though no petroleum was generated in the era, the fissures and cavities served as traps to store floating petroleum generated in the later eras.

Since then, Daqing and Shengli, China's No 1 and No 2 oil producers, have also discovered petroleum from this kind of formation under the guidance of the new concept.

In Renqiu, scores of wells sunk through such formations each produced over 1,000 tons of oil daily.

The only trouble is that the well bottoms have to be enlarged through a corrosion process with acid to make it easier for oil to gush out, according to Renqiu experts.

The discovery and study won a prize from the State Science and Technology Commission.

CSO: 4010/167

## OIL AND GAS

### FIRST PRODUCTION WELL TO BE SUNK IN BOHAI FIELD

OW111649 Beijing XINHUA in English 1625 GMT 11 Sep 85

/Text/ Tianjin, 11 Sep (XINHUA)--The first production well will be sunk by the end of this year in Bohai Sea oilfield which has been jointly prospected by China and Japan since 1980.

This will mark a transition from prospecting to exploitation of the 25,500 square km offshore oilfield which adjoins the Shengli oilfield in Shandong Province and the Dagang oilfield in the Tianjin area.

So far eight test wells have been sunk in the BZ28-1 structure, said a spokesman for the Bohai Sea petroleum base in Tanggu, near Tianjin, today.

Four of these are ejecting oil. The first is producing a daily average of 1,000 tons of oil and 240,000 cubic meters of gas, he added.

Six to eight more production wells are planned for the BZ28-1 structure, the spokesman said.

Altogether, eight structures, including BZ28-1, have been found abundant in oil.

Obviously encouraged, said the spokesman, the Japanese side has decided to increase its share of the prospecting investment from 200 million to 600 million U.S. dollars.

One structure well be exploited for commercial purposes in each of the next 5 years.

Exploitation will go hand in hand with prospecting in the oilfield, which will be finished by 1987, the spokesman said.

CSO: 4010/169

## OIL AND GAS

### PROSPECTS FOR OIL RESOURCES IN MESOZOIC BASINS IN EAST CHINA

Beijing SHIYOU KANTAN YU KAIFA [PETROLEUM EXPLORATION AND DEVELOPMENT] in Chinese Vol, 12, No 1, 1985 pp 22-25, 46

[Article by Liu Yuying [0491 3768 5391]: "Prospects for Oil and Gas Resources in Mesozoic Basins in China"]

[Abstract] Mesozoic basins in East China, rich in oil and gas resources, are one of the key regions for further enhanced exploration. This paper, based on an analysis of the distribution, evolution, depositional features and oil generation conditions of these sedimentary basins, gives a preliminary evaluation of the favorable oil and gas bearing region in these Mesozoic basins.

[Text] The East China region refers to the vast area of land east of the Luliang Shan, Hua Shan, Qinling mountain land and Wu Shan and north of the Chang Jiang, including the Northeast China Plain, North China Plain, part of the upper and lower Chang Jiang Plain and the eastern region of the Nei Monggol Plain. Over 30 Mesozoic sedimentary basins are distributed throughout these regions with a total area of 700,000 square kilometers.

East China is a major oil and gas producing region. At the end of 1983, reserves in the Mesozoic basins made up one-half of those in East China with an output about 50 percent of the national total. It is estimated that within a definite period of time in the future, this will become a major region in the development of the petroleum industry in China.

Practice in exploration has shown that oil and gas can be found in sedimentary basins which have the conditions for oil generation, while the degree of enrichment in oil and gas resources is primarily controlled by the history of the development of these sedimentary basins, and the quality of oil and gas is primarily related to the depositional environment, type of organic substance and the degree of thermal evolution of the oil-generating formation. This paper is a preliminary study of the favorable Mesozoic oil and gas bearing regions in East China based on the aspects mentioned above, and it provides a basis for further expanding oil and gas exploration in East China.

#### I. Distribution and Evolution of Mesozoic Sedimentary Basins in East China

Analyzing from the standpoint of tectonics, East China primarily includes what Professor Li Siguang [2621 0934 0342] advanced as the second zone of

subsidence and some areas of the elevated zones on its eastern and western flanks. Apart from its control by the enormous Cathaysian structural system, Mesozoic and Cenozoic sedimentary basins distributed in this region are also influenced by the latitudinal structural system. The distribution of these basins is primarily in a north-north-east direction and secondarily in an east-west as well as a northwest direction. These basins separately developed in the Ergune fold system, Jilin-Heilongjiang fold system, Nei Monggol-Great Hinggan fold system as well as the North China platform and Yangzi platform. The conditions of development of the various basins in the Mesozoic period can generally be divided into three stages:

#### 1. Stage of fault-fold uplifting (Upper Triassic--Middle Jurassic)

The Indosinian movement at the end of the Triassic period put East China in a state of uplifting. As a result, most of the regions lack Triassic sedimentation, and some of the Triassic strata are preserved only in some areas of western Henan in the depressions of Loyang, Jiyuan, Kaifeng, Luyi and Linqing. Elevation of the northern Jiangsu region ended the widely-distributed Lower and Middle Mesozoic marine deposit, and only the Jiangdu-Yangzhou area received red Upper Triassic strata 300 to 400 meters thick.

Due to the fault-depression activities of the first and second episodes of the Yanshanian movement in the lower and middle Jurassic epochs, the Erlian and Hailar fault-depressions began to form in the Inner Monggol-Greater Hinggan Hercynian folding zone. Among the accumulation were large and thick diluvial and alluvial type of molasse formation, coarse and clastic diluvial formation and swamp coal-bearing formation as thick as 4,150 meters. Some fault-depressions were also formed in the Yanliao and northern Hebei regions. For instance, in the Taizihe river basin, Chaoyang-Beipiao and Nanpial regions, Gravel rock and coal-bearing formation 3,000 to 4,000 meters thick intercalated with volcanic rock about 1,000 meters thick were deposited; and in Jiyang, Luoyang-Jiyuan and northern Jiangsu regions, coal-bearing clastic rocks 2,000 meters thick were deposited.

#### 2. Stage of fault-depression and depression development (Upper Jurassic--Lower Cretaceous)

In the late Upper Jurassic period, strong block-faulting caused the formation of a series of graben basins of various sized in the regions among which were widely deposited coal-bearing beds accompanied by the overflowing of large quantities of lava. At this time, the fault depressions developed and were distributed throughout the region, and segmentation was strong among them. For instance, over 20 small fault depressions with a total area of 120,000 square kilometers were formed along the eastern and western fault zones in the Songliao Basin. By the third Yanshanian episode at the end of the Jurassic period the subsidence movement dominated, and consequently the Lower Cretaceous period became the height of the development of Mesozoic sedimentary basins in the East China region. At that time, the Songliao and Erlian Basins were largest in scale, with an area of sedimentation of 260,000 and 110,000 square kilometers respectively, in which lacustrine strata 3,000 to 5,600 meters thick were deposited; and with the exception of the central part of central



Hebei, in the North China region Lower Jurassic and Upper Cretaceous deposits generally exist in all other depressions. The area of distribution of the Linqing, Jiyang, and Jiaolai basins was as much as 100,000 square kilometers while that of Jianhan, Zhoukou, Hefei, and northern Jiangsu regions it was about 140,000 square kilometers. This clearly shows that this period was the height of the development of Mesozoic sedimentary basins.

### 3. Period of basin shrinkage (Upper Cretaceous)

The fourth Yanshanian episode at the end of the Lower Cretaceous period was dominated by the uplifting of fault-folds. At this time, most of the sedimentary basins in the region uplifted to form continent, thereby ending the history of the development of the basins. Only small scattered lakes have remained in some areas, for instance, gypsum-bearing mudstone and red strata several hundred meters thick were deposited in the Linfanjia area of the depressions in Wuji and Qiuxian in Shijiazhuang, Jiangnan, and Jiyang. Sedimentation continued only in the northern Jiangsu and Jiaolai basins with strata 2,000 to 4,000 meters thick. By the late Cretaceous period, the last Yanshanian episode had elevated the entire region and the Mesozoic strata in the region suffered different degrees of denudation, thereby completely ending the history of the development of Mesozoic basins.

## II. Depositional Features and Oil Generation Conditions of Mesozoic Basins in East China

The Triassic system is mainly distributed in the Linqing, Kaifeng, Jiyuan, Luoyang, Linru, and Zhoukou basins in the southern part of North China over a total area of about 14,000 square kilometers. It has been encountered in drilling by wells Ci-1, Tanggu-3, and Yushen-1 in Linqing, Kai-23 in Zhongmou, Meng-1, 2, and 3 and Jican-1 in Jiyuan, and Luo-1 in Luoyang. This suite of strata was a lacustrine deposit of alternating brown, dark gray and grayish black mudstone and sandstone 3,000 to 4,000 meters thick. The Middle and Upper Jurassic systems were products of the early period of faulting. The basal part is mostly gravel-filled while the middle and upper parts are mainly limnetic coal-bearing rocks intercalated with volcanic rock formation. They are 1,500 to 4,000 meters thick and are primarily distributed in the Erlan, Hailar, Jiyang, Jiyuan, and Northern Jiangsu basins. The area of distribution of the Lower Jurassic system is fairly extensive. The entire region is primarily fault basin sedimentation with considerable variation in thickness ranging from 1,000 to 5,000 meters, and are primarily limnetic coal-bearing rocks and volcanic rock formation. The lower part of the Erlan, Hailar, Kailu, and Fuxin basins is a volcanic and pyroclastic rock formation while the upper part is a coal-bearing formation; the Songliao, Liaohé, and Beijing basins are lacustrine strata intercalated with volcanic rock; the Jiaolai and Jiangnan basins are a lacustrine and swamp sedimentary formation 2,000 to 4,000 meters thick with its volcanic rock undeveloped; the Jiyang and Northern Jiangsu basins are distributed with a coarse clastic formation intercalated with volcanic rock 2,500 to 3,000 meters thick. The area of distribution of the Lower Cretaceous system is the most extensive. The Songliao and Erlan basins have a deposit of over 5,000-meter thick lacustrine oil-generating formation; the lake basins of the North China and northern Jiangsu regions are smaller in

scale, moreover, because of the arid paleo-climate, their basal part is a thick layer of variegated gravel rock and gypsum-bearing mudstone and their upper part has a deposit of over 1,500-meter thick lacustrine facies oil-generating formation. Due to frequent tectonic movements, the Jiangnan Basin has a roughly 2,00-meter-thick deposit of reddish-gray alternating strata, and only the Jiyang and Jiaolai basins have an accumulation of volcanic rock formation 1,300 to 3,000 meters thick because of strong volcanic activities. Most parts of the region lack the Lower Cretaceous strata apart from the 2,000 to 4,000-meter-thick brownish red and purplish red arenaceous mudstone and gypsum-bearing mudstone and basal conglomerate with the upper part intercalated with a thin layer of grayish green and grayish black mudstone in the Jiaolai, Northern Jiangsu, and Jiangnan basins.

Judging from the depositional features described above, all strata of various Mesozoic formations within the region have dark mudstone several hundred and up to a thousand meters in thickness which is favorable to the generation and accumulation of organic matter. Current geochemical data clearly show that it has a definite oil-generating capacity.

Table 1.

Position	Thickness of Dark Mudstone (meters)	C (%)	Oil Generation Targets		Total Oil Generation Potential (Kg of hydrocarbons per ton of rock)	Areas of Distribution of Dark Mudstone
			Asphalt A (%)	Total Hydrocarbons (ppm)		
K <sub>2</sub>	240	0.23	0.0749	73.0	0.75	Shijiazhuang
K <sub>1</sub>	500-1,500	0.43-2.2	0.07-0.533	500-1,600	3.94-12.0	Songliao, Erliao, Beijing, Wuqing, Shijiazhuang, Qixian, Northern Jiangsu, Jiangnan
J <sub>3</sub>	100-1,500	0.51-2.95	0.058-0.1383	235-651	1.09-3.77	Songliao, Erliao, Beijing, Wuqing, Liaohu, Fuxin, Jiaolai, Hailar
J <sub>1-2</sub>	100-several hundred	0.8	0.027	140		Jiyang, northern Jiangsu
T	200-844	0.4-1.0	0.01-0.09			Jiyuan, Luoyang, Puyang

Table 1 shows that Mesozoic dark mudstone is quite commonly distributed in the region. Based on preliminary study, Mesozoic dark mudstone can be divided into three types of oil-generating formation. They are:

1. Lacustrine facies oil-generating formation with fresh-slightly saline water medium. This type of oil-generating rock is the product of the height of development of lake basins. Sedimentary lake basins have large areas, their oil-generating rock is widely distributed and their thickness is stable. They are primarily large suites of rich organic dark gray mudstone and are intercalated with oil shale strata, abundant in fossils and are of sapropelic or mixed parent material. Their oil-generating potential is large and the hydrocarbon content of rock is generally 3.94 to 12 kilograms per ton. They are the most favorable oil-generating formation and large oil and gas fields are related to this type of oil-generating rock. For instance, the Lower Cretaceous oil-generating rock of the Songliao, Erlian, Qixian, and Beijing basins are of this type.

2. Limnetic and swamp coal series oil-generating formation, which was primarily distributed in the early period of the formation of fault depressions. The segmentation of lake basins was fairly strong, the water was fairly shallow, the paleo-climate was damp and higher plants were abundant. The sediment is a suite of dark gray-grayish black arenaceous mudstone and carbonaceous mudstone intercalated with coal beds or coal lines and rich in organic carbon. This type of oil-generating rock has a high organic carbon content and are of sapropelic parent material. Its oil-generating potential is small and its hydrocarbon content is generally 1 to 4 kilograms per ton. Its oil-generating schale is small and is mainly for gas generation. The Upper Jurassic shallow oil formations in the Fuxin Basin are of this type.

3. Saline lake gypsum-bearing mudstone oil-generating formation. This type of oil-generating rock developed in lakes of a semisaline-saline medium in arid climate. It is primarily gray and dark gray mudstone intercalated with saline rock and gypsum strata. The mudstone is rich in gypsum spots. This type of mudstone has a low content of organic matter, but being in a strong reductive environment, it is favorable for the preservation and transformation of organic matter and can generate a certain amount of oil and gas. The oil-generating rock of Qianjiang formation and the oil-generating rock of Shasidian of Jinxian depression is the Jiangnan Basin are of this type.

Practice has demonstrated that all three types of oil-generating formation can generate oil and gas, moreover, oil-gas fields and oil-gas currents have been separately obtained from them. Attention should primarily be given to exploring the first type.

### III. Favorable Oil and Gas Bearing Regions and Their Prospects

1. Development of Mesozoic formations in Linqing depression complete, further enhanced exploration necessary

Based on seismic data, the thickest Mesozoic deposit is estimated at 8,000 to 10,000 meters with an area of distribution of 22,500 square kilometers. Dark mudstone has been encountered at the Upper Cretaceous deposit in the Qixian

depression, Jurassic deposit in the Shenxian depression and the Triassic deposit in the Yushen-1 well in the Dongpu depression with respective thickness of 800, 144 and 191 meters. Organic geochemical data has shown that they have a certain capacity for oil generation. Moreover, sandstone with oil spots and oil traces was found in the rock core in Yushen-1 2311, and the structure and reservoir are both relatively developed. A great deal of geophysical work has been done on this depression since the 1950's and Mesozoic deposit has been encountered in over 10 wells. But due to the lack of systemic comprehensive study, many questions remain unanswered and it is necessary to further enhance exploration and research to pinpoint favorable prolific structures.

## 2. Triassic, Lower and Middle Jurassic deposits in the Jiyuan-Luoyang Basins are target strata deserving attention

Dark mudstone over 900 meters thick has been encountered in the Triassic and Middle and Upper Jurassic deposits outcropped on the periphery of this region. The deep well Jican-1 which is currently in drilling operation encountered dark gray arenaceous mudstone up to 1,000 meters thick (not yet drilled through) below 3,850 meters. Moreover, oil and gas indication was seen widespread in the well. Fluorescence, oil emulsion, oil spots, oil-bearing sandstone and unusual gas test results were separately found in Meng-1, 5 and 7, Qin-3 and 7, Ji-2 and 3 and Jican-1 wells. The central upwarped zone in this basin is situated between the north and south downwarped zones favorable to the migration and accumulation of oil and gas. This is a region which deserves to be further explored.

## 3. Good prospects for finding oil in the Upper Jurassic deposit in the Jiaolai Basin

This basin is situated on the Jiao-Liao old landmass and it is a Mesozoic sedimentary basin formed on the pre-Sinian base with an area of 12,--- square kilometers. Its Middle and Upper Jurassic deposit is a fairly deep lacustrine sedimentation 2,000-4,000 meters in thickness. Its volcanic rock is undeveloped and 370-meter thick dark mudstone has been encountered in the J<sub>3</sub>4 Shuinan formation. Geochemical data has shown that this mudstone is rich in organic substance, high in the degree of reduction and is favorable to the preservation and evolution of organic matter. Outcropped oil seepage is extensive. Oil seepage has been sighted at 29 locations in 5 counties, oil spots and slightly oil-bearing sandstone has been found at 23 places in 7 shallow wells and asphalt veins have been sighted in the oil shale fissures in Lai-1 well, which shows that this basin had undergone a process of oil and gas generation. But the elevation of this basin in the late Mesozoic was fairly intense and a large portion of the Jurassic deposit is outcropped. We should drill one or two parametric wells in the Laiyang depression where conditions for preservation are better and further study its conditions for oil generation.

## 4. Upper Jurassic deposits of basins in northeast China may become a domain of new oil finds

Upper Jurassic deposits in the Songliao Basin are distributed in over 20 fault depressions with a total area of 120,000 square kilometers. Drilling in



Dehui, Sanzhao, Nongan, Yangdachengzi, Qiqihar, and Hulan Ergi has encountered dark mudstone 300 to 800 meters thick with an organic carbonaceous content as high at 1.114 to 8.871 percent and total oil generation potential of 3.82 to 6.155 kilograms of hydrocarbons per ton of rock. According to studies at the Daqing Oilfield, the crude oil below the Quansanduan in Nongan area comes from the Jurassic oil-generating formation and the natural gas in Zhaoshen-1 well also comes from that formation. This shows that Jurassic deposits in the Songliao Basin may become another good target formation and a new deposit that deserves further exploration and study. In the depressions east of Hailar, Kailu, and Liao he as well as the Yanshan-fold, the numerous Jurassic fault depression basins (such as Chaoyang, Beipiao, Taizihe river basin, Xinbin-Hengren) have developed a coal-bearing rock formation and volcanic rock formation. Dark mudstone is commonly sighted, oil and gas indication is extensive, and it is hopeful that the Fuxin type of shallow oil formation can be found.

#### 5. Mesozoic deposits in the Northern Jiangsu Basin also deserve further exploration

The development of Mesozoic deposits in this basin is complete and their distribution is extensive. Coal formations 1,200 meters thick have been sighted in the Lower and Middle Jurassic Ziangshan group, dark mudstone several hundred meters thick has been observed in the Lower Cretaceous Gecun formation and Upper Cretaceous Chishan and Taizhou formations, and oil and gas indication is widespread. However, little study has been conducted and it is a new domain that deserves further exploration.

#### 6. Distribution of Lower and Middle Jurassic deposits in the Jiyang depression is very extensive; area of primitive basin is estimated at 25,000 square kilometers

Based on seismic data, its greatest thickness is estimated to be 3,000 meters. Its lower part is a coal-bearing rock formation and its upper part is a arenaceous mudstone interbedding. It is mainly distributed in the Zhanhua and Chenzhen depressions, and industrial oil and gas deposits have been found in the Lower and Middle Jurassic deposits at Kenli, Yihezhuang, Zhuangxi-Wuhaozhuang. According to studies by the Shengli oil field, the major source of the Mesozoic oil deposits described above comes from the Lower Tertiary deposit and are "generated in the Cenozoic and stored in the Mesozoic." In the future, besides continuing to explore this type of oil deposits, we should also intensify study on the conditions of Mesozoic oil generation and provide a basis for finding "self-generating and self-storing" oil and gas deposits.

The above preliminary study shows that oil and gas exploration in Mesozoic East China is broad in scope and bright in prospects, but we need to explore further, intensify research, and provide new realms for continuously increasing our reserves of oil and gas resources.



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\* See JPRS 82086, CHINA REPORT/ECONOMIC AFFAIRS, No. 276, 27 October 1982, pp 158-172

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9586

CSO: 4013/128

BRIEFS

LIAONING GAS PIPELINES--Three natural gas transmission pipelines are under construction in the central part of Liaoning Province in order to transmit a part of the natural gas produced by the Liaohe Oilfield to large and medium enterprises in Shenyang, Benxi, and Liaoyang cities. The total length of these three pipelines is designed at 171 km. Upon completion, these three pipelines will transmit 700,000 cubic meters of natural gas daily. [Summary] [Shenyang Liaoning Provincial Service in Mandarin 31 Jul 85]

SHENGLI OUTPUT UP--This year the production targets of Shengli Oilfield in Shandong Province increased by a large margin over the corresponding period of 1984. Shengli oilfield fulfilled 2.115 million li of well drilling and footage, an increase of 134 percent over the corresponding period of last year; and produced 13.3 million tons of crude oil, an increase of 28.8 percent over the same period of last year. [Summary] [Jinan Shandong Provincial Service in Mandarin 2200 GMT 19 Aug 85]

DAQING UNDERGROUND GAS STORAGE--The flares burning day and night in the Daqing oil field covering the length and breadth of 100 li have become fewer and fewer over the past 10 years. Where has the natural gas, the source of these "flares" gone? It has been stored in underground gas storage facilities. With these underground facilities the contradictions between the use of gas in winter and summer have been effectively balanced. Gas is stored in summer and drawn from the facilities in winter. These underground facilities have helped save energy and money from the burning "flares." At present, a third underground gas storage facility constructed by the Natural Gas Company of the Daqing oil field, is being built. One of the two facilities has been in operation for 10 years with a capacity for storing 38 million cubic meters. The other has entered a trial stage with a capacity for storing 1.5 billion cubic meters. The Daqing oil field is the first and only field in China with underground gas storage. According to statistics, the first underground gas storage put into operation has stored 88.9 million cubic meters of gas, of which 82.8 meters have been withdrawn. [Excerpts] [Harbin HEILONGJIANG RIBAO in Chinese 2 Sep 85 p 1 SK]

SHENGLI OUTPUT INCREASES--As of 0800 on 29 September, the daily crude oil output of the Shengli oil field surpassed 80,000 tons. The crude oil output this year has reached 20.09 million tons, 54 days ahead of the date when the crude oil output surpassed 20 million tons last year. Since the beginning of this year, the Shengli oil field has firmly readjusted the relations between oil injection and oil extraction and attended to adjusting and applying new technology for developing oil fields so that a steady increase of the crude oil output can be ensured. So far, the daily crude oil output has increased by 10,000 tons over that of the beginning period of this year. [Text] [Jinan Shandong Provincial Service in Mandarin 2300 GMT 29 Sep 85 SK]

KARAMAY STEAM INJECTION--Shanghai, 9 Aug (XINHUA)--The first two Sha made steam-injection boilers, used to recover oil, were tested successfully today, and will soon be transported to the Karamay Oilfield in Xinjiang Uygur Autonomous Region. The boilers, produced jointly by the Shanghai Sifang Boiler Factory and Houston Systems Manufacturing Company, will be used to inject steam into oil layers to recover thick oil. This technique, called thermal recovery, increases oil output and speeds up recovery. Another three boilers, each costing more than U.S.\$200,000, will be produced by the factory this year. [Text] [Beijing XINHUA in English 1844 GMT 9 Aug 85]

NEW DRILLING TECHNIQUE--Beijing, 3 Oct (XINHUA)--A new technique which increased the drilling speed and cuts costs of oil-well operations had passed appraisal in Beijing, today's GUANGMING DAILY reported. The technique, named "optimum parameters for drilling," was developed by the Petroleum Exploration and Development Research Institute and two other petroleum-related bureaus. Scientists from those units have adopted advanced systems engineering and microcomputer technology in their experiments since 1982; they completed the project ahead of schedule. In the last 3 years, the research group drilled 100 wells with an average depth of 3,033 meters. The technique has increased drilling speed by 21.5 percent while costs have been cut by 10 percent. Under the new process, China's oil-well drilling will be based on quantitative and computerized methods instead of the conventional experienced-based, qualitative methods. The new technique is also expected to save 300 million yuan in drilling costs each year. [Text] [Beijing XINHUA in English 1048 GMT 3 Oct 85 OW]

CSO: 4010/4

## NUCLEAR POWER

### HEILONGJIANG NUCLEAR POWER PLANT EQUIPMENT COMPANY FORMED

SK230747 Harbin Heilongjiang Provincial Service in Mandarin 1000 GMT 21 Sep 85

[Text] The Dongbei [Northeast] Electric Equipment Economic and Technological Group and the Heilongjiang Provincial Nuclear Power Equipment Manufacturing Company were established in Harbin City today. As the main body, the Dongbei Electric Equipment Economic and Technological Group with three large power plants in Harbin is a company producing complete sets of equipment for power stations. It is an economic and technological association composed of 29 units in the Northeast Region, including power equipment, power projects, design, scientific research, manufacturing, and installation units, each of which has different responsibilities. Under the principle of voluntary participation, equality, and mutual benefits, units joining this association will coordinate with each other in thermal power technology, hydroelectric power, and nuclear power projects to achieve simultaneous development and technological progress in enterprises. They will jointly contract to design complete sets of equipment for domestic and foreign power station projects, to introduce and supply equipment to power stations, and to render technical services. They will mutually exchange technological and business information and carry out various forms of service work for consumers. This is of great significance in further displaying the superiority of the power equipment design, research, and manufacturing of the northeast region, expediting the pace of power construction, and expanding the export of the complete sets of power equipment.

The Dongbei Electric Equipment Economic and Technological Group will implement the system of charging the board of directors with full responsibility. Through democratic discussions and consultations, Comrade An Zhendong, vice governor, was named honorary president of the board of directors. (Lian Yushi), general manager of the Harbin Power Station Equipment Company, was named chairman of the board of directors.

The Heilongjiang Provincial Nuclear Power Equipment Manufacturing Company which is composed of 14 scientific research units from colleges and universities, and plants with a capacity of manufacturing equipment for nuclear power plants is an economic and technological association voluntarily organized and established to cope with the needs of developing China's nuclear power. The main

tasks of this company are to participate in the manufacturing, bidding, and contracts of China's large, medium-sized, and small nuclear power plant equipment, to subcontract the tasks of designing, manufacturing, installing and distributing the equipment and the nuclear power low-temperature heating equipment for the nuclear power plants, to strive to manufacture more equipment and nuclear power low-temperature heating equipment for the nuclear power plants and to contribute to the development of China's nuclear power. This company will implement the system of charging the manager with responsibility under the leadership of the board of directors.

CSO: 4013/3

## NUCLEAR POWER

### BRIEFS

ZHEJIANG NUCLEAR POWER PLANT--The third stage in the construction of the Qinshan nuclear power plant, a major state construction project, has begun. The second stage in the construction of the power plant was completed recently 4 days and 8 hours ahead of schedule. The third stage, which is scheduled to be completed by the end of 1986, includes the construction of the nuclear and conventional power transmission systems, the water-cooling systems, and some buildings of the plant. [Summary] [Hangzhou Zhejiang Provincial Service in Mandarin 1000 GMT 25 Jul 85 OW]

CSO: 4013/171



## SUPPLEMENTAL SOURCES

### GANSU A LEADER IN SOLAR ENERGY RESEARCH, APPLICATION

OW291038 Beijing XINHUA in English 0845 GMT 29 Sep 85

[Text] Lanzhou, 29 Sep (XINHUA)--With its plentiful solar energy now being tapped, Gansu Province has become China's major solar energy research and application base.

It now has more than 49,000 solar cookers, the most for any region in China. Solar-heated houses cover 18,000 square meters.

Use of solar energy has extended from cooking to bathing, lighting, sauce-making, drying, chicken-raising, and vegetable cultivation, according to local scientists.

A great part of the province is arid and has an average 2,600-3,300 hours of sunshine a year.

Since 1980, research institutions in Gansu have carried out 45 research projects on solar energy application. Some papers have been submitted to an international academic symposium on solar energy application and drawn attention from specialists at home and abroad.

At present, the province has nine scientific and research institutions specializing in solar energy studies, with 130-odd research personnel.

Gansu also has 20 solar energy equipment factories with an annual production capacity of 120,000 square meters for solar water heaters alone. They also sell some of them to neighboring provinces. The province has also set up China's first solar energy corporation and the first solar energy center, which will become the national solar energy research center and serve international technical cooperation, experimentation, training, and study.

CSO: 4010/4

## SUPPLEMENTAL SOURCES

### STATUS, PROSPECTS FOR PRC'S GEOTHERMAL RESOURCES

Beijing ZHONGGUO DIZHI [CHINA GEOLOGY] in Chinese No 1, 13 Jan 85 pp 19-22

[Article by Zhang Yecheng [1728 2814 2052], Hu Jingjiang [5170 2529 3068], and Zhou Ruiliang [0719 3843 5328]: "Status of China's Geothermal Resources and Prospects for Their Development and Utilization"]

[Text] I. Basic Characteristics and Pattern of Distribution of China's Geothermal Resources

China is a country with relatively abundant geothermal resources. At present, over 2,600 hot springs have been discovered and there are over 200 thermal wells, all widely distributed throughout the vast areas of China (see Figure 1). These hot springs (and wells) are the windows of geothermal energy. By making a comprehensive analysis of their basic conditions and background circumstances we can sum up several prominent features of China's geothermal resources as follows.

#### 1. Geothermal resources are primarily medium and low temperature thermal water

Based on the forms in which it is stored, geothermal energy may be divided into four types: hydrothermal (which can be further divided into steam and hot water), geostatic pressure, xerothermic rock, and magmatic). In China, although we cannot rule out the existence of the last three types of geothermal high-energy resources which may be of considerable potential, the widely distributed medium-and low-temperature thermal water resources are of the most immediate significance. Judging from the water temperature data of the hot springs, more than 80 percent of them are below 80°C (of which the most extensively distributed are low-temperature hot springs below 60°C) while high temperature hot springs ranging from 80°C to 100°C are mainly distributed in some regions in southeastern and southwestern China (individual cases of superhigh-temperature thermal water or steam over 100°C are also found in individual areas of these regions). Judging from the thermal wells within subsidence basins, water temperatures at depths of 1,000 meters are generally between 30°C and 50°C and those at depths of 2,000 meters are generally between 55°C and 80°C with the exception of some areas which are as high as 90°C to 100°C (see Figure 2), which are also medium and low temperature thermal water.

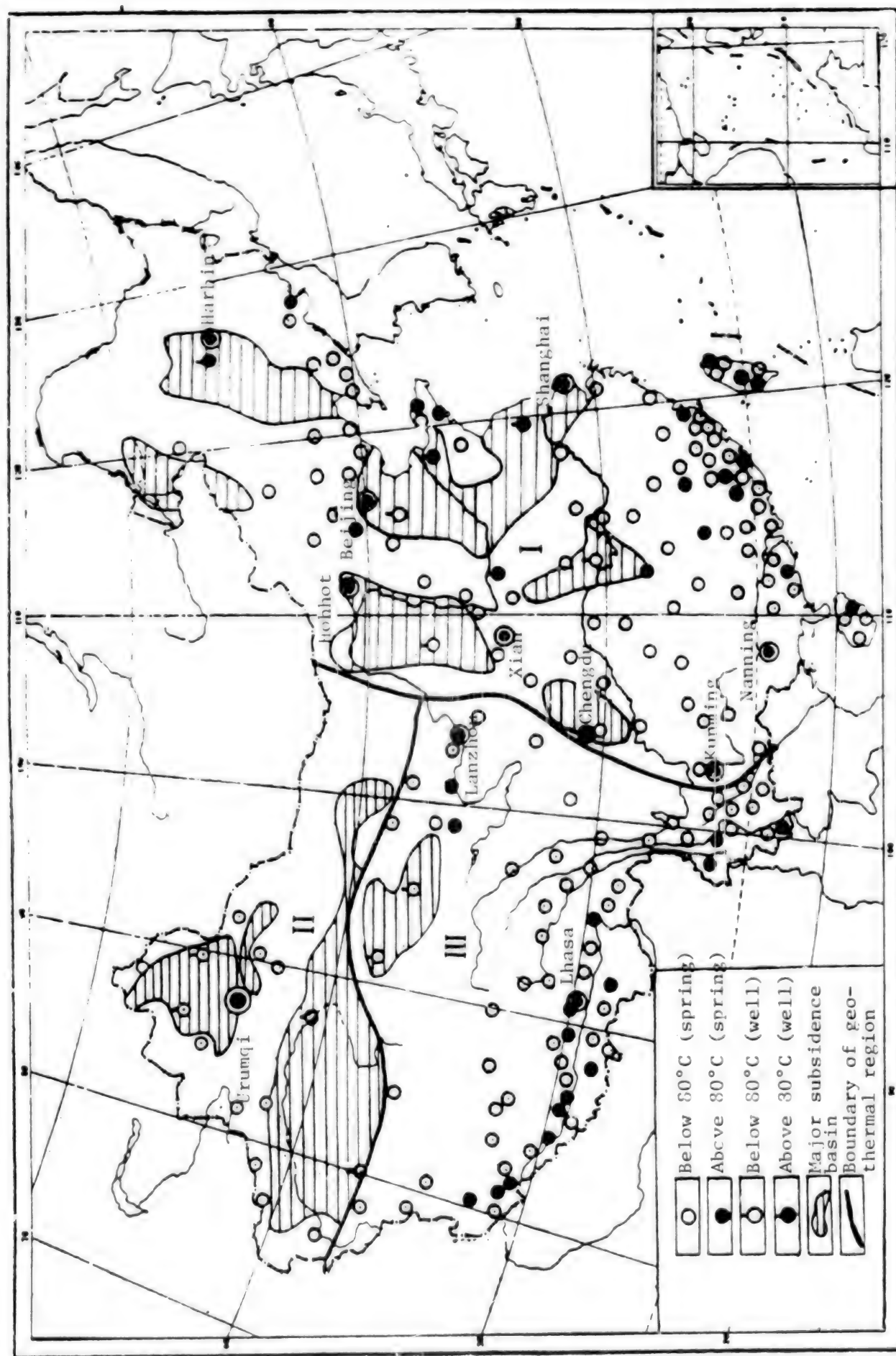


Figure 1. Distribution of Geothermal Water in China

I. Eastern geothermal region

II. Northwestern geothermal region

III. Southwestern geothermal region

This basic condition is determined by China's regional geothermal fields. Estimating from the thermal water temperatures of hot springs and wells, the geothermal gradient of the major subsidence basins in China is generally between 2.3°C and 3.6°C while it is slightly lower for upwarped mountain land which is generally between 2.3°C and 3.2°C.<sup>1</sup> Moreover, we have currently measured more than 20 geodetic heat flow values which are between 1.3 and 1.7 HFU.<sup>2</sup> These two basic indicators which can best reflect geothermal characteristics are roughly the same as the averages in the world (geothermal gradient of 3°C and geodetic heat flow of 1.47 HFU). This fully illustrates that the vast areas of China belong to "normal" geothermal fields like most regions in the world.

## 2. Basic types of medium and low temperature thermal water

These can be divided into fissure thermal water of upwarped mountain land and pore thermal water of subsidence basins. The two differ in characteristics (see Table 1).

From Table 1, one can see that fissure thermal water of upwarped mountain land is actually a special type of bed rock fissure water, one of whose characteristics is its greater instability and subjection to even stricter tectonic control. Large amounts of actual data have shown that at composite area of structural systems or junctions of fractures in the same structural system but of different directions and nature, temperatures and quantities of geothermal water are high and they are usually favorable grounds for the formation of geothermal fields. Examples include the Fuzhou geothermal field and the Huhaoyao geothermal field in Hebei.

The quantities of water of thermal wells in subsidence basins are primarily determined by the enrichment of thermal water-bearing beds and their supplementary conditions while water temperatures are primarily determined by the depth of heat-storing layers and the level of geothermal gradients. The results of geothermal surveys of many subsidence basins have shown that the isothermal level of geothermal water frequently vary synchronously with the rise and fall of the bed rock below the friable rock formation, which quite clearly shows that the two are interrelated. In basally raised areas of appropriate sizes, because thermal conduction and convection of water result in heat concentration, the geothermal gradient increases (as high as 4°C to 6°C in the North China, Songliao and Northern Jiangsu Basins, with water temperatures between 50°C and 70°C at depths of 1,000 meters). At the same time, when the bed rock is soluble rock developed by fissure and karst, at depths of exploitation which are not too great (generally 2,000 meters or less) it is not only possible to exploit the upper pore thermal water but we can frequently expose and exploit the fissure-karst thermal water below, that is, forming "buried hill thermal fields." It is the most favorable area for finding and exploiting geothermal water within subsidence basins. Examples include the Tianjin thermal field and the Xiongxian County thermal field in Hebei.

## 3. Distribution of geothermal resources is clearly divided into regions and zones.

On the whole, the intensity of geothermal display and the degree of abundance of geothermal resources are characteristically low in the west and high in the

TABLE 1. BASIC TYPES AND CHARACTERISTICS OF GEOTHERMAL WATER IN CHINA

Type	Distribution and Form of Exposure	Conditions of Formation and Characteristics of Stored Water	Temperature of Water	Quantity of Water	Chemistry of Water
Fissure thermal water of upwarped mountain land	Distributed in upwarped mountain land and small intermountainous basins exposed to earth surface as springs	Generally, atmospheric precipitation cycles underground along structural fissures; temperature rises as it gains heat from deep-lying areas. Its major source of thermal energy is the normal geothermal increase in temperature determined by thermal conduction except individual regions where it is determined by volcanic or magmatic residual heat. Its major source of water is atmospheric precipitation kept in fissures of solid rocks and shows an irregular vein-like distribution. Quality and quantity of water both unstable.	Considerable variation, generally less than 80°C; increase in temperature with depth is not obvious with the exception of individual anomalous geothermal regions.	Flow at individual springs generally 20-200 tons per 24 hrs.; exceptions are as high as over 1,000 tons.	Low degree of mineralization, generally less than 2 g/l except coastal areas; water primarily the low alkalinity heavy carbonic acid type.
Pore thermal water of subsidence basins	Distributed in large subsidence basins, lacks natural outcrop; exposed by well holes.	Underground water buried in deep water-bearing layers. It mainly depends on geothermal increase in temperature as a heat source, and its source of water is atmospheric precipitation or sealed water. They are kept in pores of friable rocks. Their formation depends on the the water-bearing layers and show a fairly continuous and stable stratified or strata-like distribution. Both temperature and quantity of water are fairly stable. All are confined water which can flow on their own in some regions.	Water temperature determined by geothermal gradient; it generally increases with depth and gradually rises. Generally 30°C-50°C at depths of 1,000 meters and 50°C-90°C at 2,000 meters.	Single-hole gush is generally 100-500 tons per 24 hrs.; exceptions as high as 1,000-2,000 tons per 24 hrs.	High degree of mineralization, 2-10 g/l for most basins and as high as 50-300 g/l in some saline basins. Water is primarily the Cl-Na type, often rich in bromine, iodine and barium.



east, and low in the north and high in the south. According to the pattern of regional variation, China can be divided into three geothermal regions and each region is subdivided into several geothermal zones.

The eastern geothermal region: the region east of the Helan Shan, Longmen Shan and Ailao Shan is relatively abundant in geothermal resources. Within this vast region which covers one-half of China, the formation and distribution of geothermal resources are primarily controlled by the Neocathaysian structural system besides being affected by the large latitudinal structural zone and some local structural systems. It can be divided into five geothermal zones from east to west: (1) the Taiwan medium and high temperature fissure thermal water zone; (2) the Changbai Shan-Jiaoliao mountainous area-Wuyi Shan medium and low temperature fissure thermal water zone; (3) the Songliao-North China-Jiangnan Basin medium and low temperature pore thermal water zone; (4) the Greater Hinggan Range-Taihang Shan-Xuefeng Shan low temperature fissure thermal water zone; and (5) the Hulun Buir-Shaanxi-Gansu-Ningxia-Sichuan Basin low temperature pore thermal water zone. They are arranged in a row in a NNE direction. The condition of geothermal resources improves from west to east. Taiwan Province in zone (1) at the eastern end is the world famous "volcanic zone"--component part of the circum-Pacific geothermal zone and whose geothermal display is very strong. There are more than 100 hot springs throughout the island and most of their water temperatures are in excess of 80°C. Drilling to depths of 1,000 meters in the Datun volcanic hot spring area in the north yields high-temperature steam of 294°C. It is an area in China which is exceedingly abundant in geothermal resources and has enormous potential for exploitation. Moreover, the Fujian and Guangdong coastal area at the eastern border of zone (4) is located in the interior side of the circum-Pacific geothermal zone, where there is a concentration of hot springs with fairly high water temperature and is also an area abundant in thermal water resources. Furthermore, geothermal water resources are relatively abundant in the North China Plain and Songliao Plain of zone (3) and the northern end of the Taihang Shan, Xuefeng Shan, the Wuling Shan district and the area around Dian Chi in Yunnan. Apart from their potential for the exploitation of geothermal energy, geothermal water within the Sichuan, Jiangnan and other large basins is saline water with a salinity as high as tens of hundreds of grams per liter which is rich in iodine, bromine, lithium, boron and other useful elements valuable for exploitation.

The northwest geothermal region: the region west of the Helan Shan and north of the Kunlun Shan, Altun Shan and Qilian Shan. The formation and distribution of geothermal water are primarily controlled by the enormous latitudinal structural zone. Four geothermal zones are arranged in a row from near east to west. From north to south they are: (1) the Altay low temperature fissure thermal water zone; (2) the Junggar Basin low temperature pore thermal water zone; (3) the Tian Shan low temperature fissure thermal water zone; and (4) the Tarim-Jiuquan Basin low temperature pore thermal water zone. All of these zones do not have a strong geothermal display, which shows that the conditions of their resources are relatively poor. Therefore, their potential for exploitation is small with the exception of certain geothermal display regions near cities and towns which have some degree of significance.



The southwest geothermal region: the region west of the Longmen Shan and Ailao Shan and south of the Kunlun Shan, Altun Shan and Qilian Shan in China has relatively strong geothermal display and relatively abundant geothermal resources. Like the tectonic conditions in this region, conditions for geothermal resources are also relatively complex. The overall pattern of variation is that geothermal display intensifies and geothermal resources becomes more and more abundant from north to south. The region can be divided into seven geothermal zones: (1) The Altun Shan-Qilian Shan medium and low temperature fissure thermal water zone; (2) the Qaidam-Gonghe Basin medium and low temperature pore thermal water zone; (3) the Kunlun Shan-Bayan Har Shan medium and low temperature fissure thermal water zone; (4) the Tangra Shan medium and low temperature fissure thermal water zone; (5) the Nyainqentanglha Shan-Hengduan Shan medium and high temperature fissure thermal water zone; (6) the Gangdise Shan-Yalung Zangbo Jiang medium and high fissure thermal water zone; and (7) the Himalaya Shan medium- and low-temperature fissure thermal water zone. Zones (1), (2) and (3) which are located in the northern part of the Qinghai Plateau show a NW-NW distribution. The formation and distribution of their thermal water resources are primarily controlled by the Xiyu system and the Qilian Shan-Luliang Shan-Helan Shan epsilon west limb structure and the Altun fault zone. The area of Gonghe, Guide and Tongren in the eastern part of zone (2) is a composite area of several tectonic systems rich in thermal water resources. Besides, the geothermal water of the Qaidam Basin is highly mineralized saline water rich in iodine, bromine, boron, potassium, barium and other useful elements significant for exploitation. The various thermal water zones (4), (5), (6) and (7) south of the Kunlun Shan show a NW-NW-near NS arc distribution whose geothermal resources are primarily controlled by the Qinghai-Xizang-Yunnan-Burma-Indonesia eta-type structural system. Of these, the Gangdise Shan-Yarlung Zangbo Jiang and the Nyainqentanglha Shan-Hengduan Shan geothermal zone is the component part of another famous "volcanic zone"--the Mediterranean-Yarlung Zangbo Jiang geothermal zone. Because the crustal shallow layers here may have partial fusion which cause "boiling" in geothermal activities, with the exception of many hot springs between 60°C and 80°C, there are also hydrothermal explosions, geysers and boiling springs, and self-overflowing geothermal water has formed numerous thermal water ponds, lakes, or rivers. The heat-storing basal temperatures of quite a few active hydrothermal regions exceed 200°C and it is a region in China where geothermal resources are exceedingly abundant and has the greatest potential for exploitation.

## II. Prospects for Development and Utilization of China's Geothermal Resources

### 1. Basic principles of exploitation and utilization

China is a developing country which finds it difficult to develop and utilize different new sources of energy on a large scale including geothermal resources. The energy structure primarily based on coal will not be changed for quite a long time. Although geothermal resources are widely distributed in China, the degree of abundance and conditions of exploitation and utilization vary considerably from region to region. At the same time, there is a great imbalance in the supply and demand of energy in different regions. Future exploitation and utilization will mainly be carried out in regions that have a shortage of regular sources of energy but have abundant supply of geothermal resources

convenient for exploitation. Therefore, from the strategic point of view in energy production, geothermal energy can merely be a new supplementary source of energy and play a considerable role in some areas. Practice in the utilization of geothermal energy at home and abroad has shown that using water (or gas) below 160°C to generate electric power is usually not economical but the prospects for utilization is very broad in many aspects of industry, agriculture and everyday life. Geothermal resources in China are primarily medium and low temperature thermal water, therefore, with the exception of some areas where we can consider developing geothermal generation of power, in the vast areas we should primarily conform to local conditions of thermal water resources (temperature, quantity and quality of thermal water) and possible ways of utilization and extensively apply them to different aspects which yield practical results. Based on the circumstances described above, the exploitation and utilization of China's geothermal resources should be carried out according to the principle of small scale and dispersed, suiting measures to local conditions and comprehensive utilization.

## 2. Recent development regions and ways of utilization

Xizang and Yunnan in the southwest and Taiwan, Fujian, and Guangdong in the southeast of China are regions most abundant in geothermal resources and undoubtedly they have considerable potential from a long-term point of view. But proceeding from the reality of developing China's energy production, geothermal generation of power has yet to be studied. Consequently, while we continue to intensify the survey and study of geothermal resources in these regions, the current emphasis of exploitation and utilization should be placed on the comprehensive utilization of geothermal water in China's eastern regions, particularly in cities and towns where conditions of thermal water are relatively favorable--first of all the large and medium-sized cities such as Beijing, Tianjin, Fuzhou, Xiamen, Zhangzhou, Changchun, and Xi'an, which are of most immediate significance. Besides its use for winter heating, boiler water supply, and air conditioning and refrigeration, thermal water of different temperatures in these places can also be used in textile, printing and dyeing, tanning, construction, the chemical industry, timber processing and other industrial production, as well as medical and health care and the development of tourism. Besides cities, numerous counties and townships in some of China's oil and gas basins have the conditions for exploitation and utilization. For instance, Fuyu, Renqiu, and Xiongxian counties and many mountainous counties and townships can be developed. In these places, not only can thermal water be used by small-scale industry in counties and communes but also in soaking seeds for crops and raising rice seedlings, growing vegetables, cultivating flowers as well as raising poultry and livestock and breeding fish.

Moreover, the geothermal water in numerous regions is rich in iodine, bromine, boron, potassium, strontium, barium and other useful elements, which can be extracted from the thermal water and used as valuable industrial raw materials in national defence, the chemical industry and medicine.

## 3. Stress the study of some real problems in exploitation and utilization

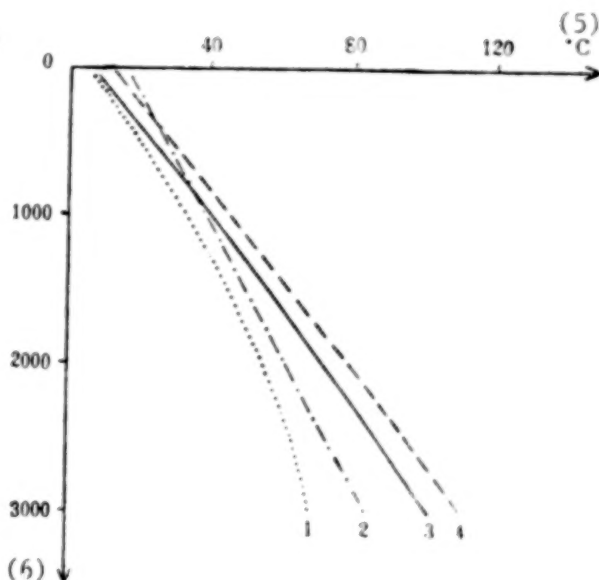
The exploitation and utilization of geothermal resources are a new undertaking. Unavoidably, some new problems that require immediate solution have emerged

along with its rise. The major ones include: the study of geothermal economics, increasing the ways of utilization, improving economic results; rational exploitation and protection of geothermal resources in order that the stability of the temperature, quantity and pressure of water may be maintained for a long time; removing and reducing various obstacles in utilization--environmental pollution, sedimentation of filth, corrosion of pipelines and so forth. By solving these real problems, we can develop even brighter prospects for the comprehensive utilization of geothermal water.

Figure 2. Correlation Graph of Thermal Water Temperature and Depth in China's Major Subsidence Basins

Key:

1. Junggar, Tarim, Jiuquan Basins
2. Sichuan Basin
3. Qaidam, Shaanxi-Gansu-Ningxia Basins
4. Jiangnan, North China, Northern Jiangsu, Songliao Basins
5. Water temperature
6. Depth (meters)



#### FOOTNOTES

1. Geothermal gradient is the increase in temperature with every 100 meters of depth (same as below).
2. One HFU is  $\mu\text{cal}/\text{cm}^2\text{s}$ .

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## SUPPLEMENTAL SOURCES

### BRIEFS

YANGBAJING GEOTHERMAL PLANT EXPANSION--On 24 August, the No 4 generator of the Yangbajing geothermal power station in the Xizang Autonomous region was formally handed over for operations. The [addition] brings the power station's total installed capacity up to 10,000 kilowatts, making it China's largest geothermal power station. [Excerpt] [Beijing ZHONGGUO JIXIE BAO [CHINA MACHINERY NEWS] in Chinese 30 Aug 85 p 1]

CSO: 4013/6

## CONSERVATION

### BRIEFS

ENERGY CONSERVATION STRESSED--At a provincial conference on energy conservation which concluded yesterday, Vice Governor Kuang Ji said that energy conservation is just as important as economic development and should become a major content of the province's economic construction. Kuang Ji pointed out: The contradiction of lack of sufficient energy will become ever more acute as economic construction develops. To solve the energy shortage, apart from grasping the opening up of South China Sea oil and natural gas, we must also promote energy conservation. Kuang Ji said: Guangdong's energy conservation target for the Seventh Five-Year Plan is to save 3.2 million tons of standard coal. To accomplish this arduous task, it is first necessary that government departments at all levels attach importance to the matter. Energy conservation offices which were abolished must be reestablished. The provincial planning commission must reestablish its energy conservation office. The provincial departments and general companies, and all prefectures and cities, must have corresponding energy conservation organs. [Text] [Guangzhou Guangdong Provincial Service in Mandarin 0400 GMT 22 Aug 85 HK]

LIAONING ENERGY CONSERVATION--In the first half of the year, industrial enterprises in Liaoning Province achieved good results in conserving energy. According to statistics, energy consumption for each 10,000 yuan of output value dropped by 8.6 percent on average from the corresponding period of 1984. Meanwhile, industrial enterprises throughout the province saved a total of 2 million tons of standard coal. [Text] [Shenyang Liaoning Provincial Service in Mandarin 1030 GMT 31 Jul 85 SK]

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